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PUBLICATION



Commercial Fisheries

REVIEW

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service

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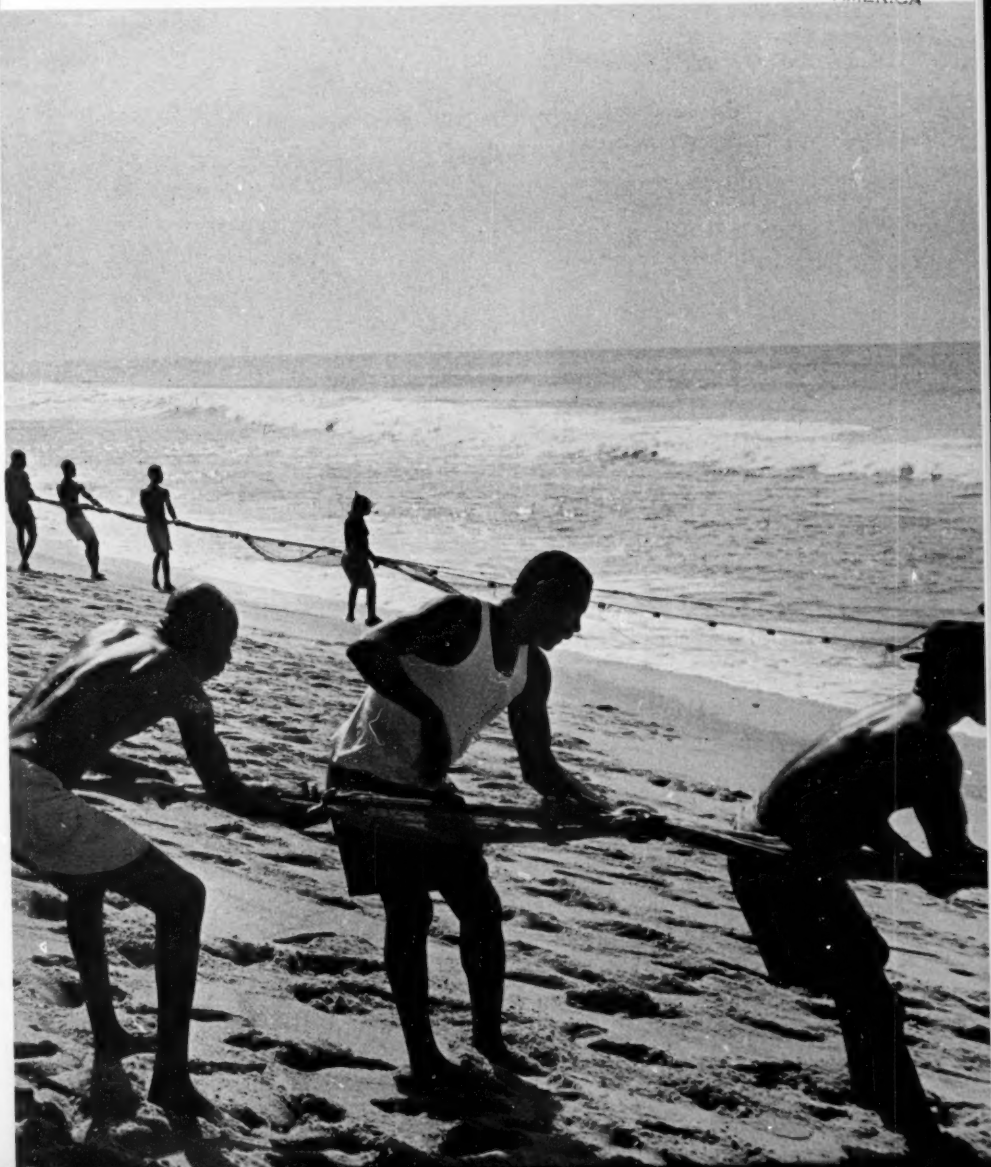
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Commercial Fisheries REVIEW

A comprehensive view of United States and foreign fishing industries — including catch, processing, marketing, research, and legislation — prepared by the National Marine Fisheries Service.

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COVER: Thousands of people in Togo live by fishing along the 75 miles of coastal belt. Beach seining is a popular method. A net is being dragged in by a team of fishermen.

(FAO: C. Bavagnoli)



U.S. DEPARTMENT OF COMMERCE
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NATIONAL OCEANIC AND
ATMOSPHERIC ADMINISTRATION
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HUTTON NAMED NMFS ASSOCIATE DIRECTOR



Dr. Robert F. Hutton, Executive Secretary of the American Fisheries Society for the past 6 years, has been named Associate Director for Resource Management in NMFS. He assumes his post in early January 1972.

Dr. Hutton will work on all aspects of fishery resource management. His jurisdiction includes programs to accelerate the State-Federal Fisheries Management System; enforcement of international fishery regulations applicable to U.S. citizens; Federal financial assistance to certain fishery programs of States and other interests on a cost-sharing basis; fishery extension service; water-resources programs to protect estuaries; and enforcement and surveillance to protect U.S. fisheries from foreign encroachment. He will be responsible for the Pribilof Island Program and Columbia River Development Program. He will have overall responsibility for about 385 employees.

Dr. Hutton's Background

Dr. Hutton, 50, is known internationally as a scientist and fishery administrator. He earned his bachelor's and master's degrees in marine biology from the University of Miami, Coral Gables, Fla.; his Ph.D. in marine biology at the University of London in 1954 while a Fulbright scholar. He has written many scientific articles on marine subjects.

From 1955-1962, Dr. Hutton was Biologist in Charge at the Florida State Marine Laboratory, St. Petersburg, Fla.; from 1963 to 1965, Chief of Marine Biology, Massachusetts Department of Natural Resources.

SLAVIN CONFIRMED AS NMFS ASSOCIATE DIRECTOR



Joseph W. Slavin, 44, NMFS Acting Associate Director for Resource Utilization, has been named Associate Director.

His responsibilities embrace: economic and marketing research on fishery products, including projections of demand and supply; foreign-trade analysis; fishery statistics and market news; financial aid to fishing industry through loans, mortgage and loan insurance, and subsidies; microbiological, chemical, and technological research to improve the quality and use of fishery resources; a voluntary national program of inspection and certification of fishery products; and programs to improve marketing practices and to lessen the effects of supply-demand imbalances. Nearly 600 employees carry out these services.

Started With BCF

In 1954, Mr. Slavin joined the old Bureau of Commercial Fisheries at its technological laboratory in East Boston, Mass. After lab was moved to Gloucester, Mass., he functioned as its director from 1961 to 1966. He then came to Washington.

Background & Affiliations

Mr. Slavin was born in Boston. He was graduated from the Merchant Marine Academy, Kings Point, N.Y., in 1948, with a B.S. in engineering. He is a member of The American Society of Heating, Refrigeration and Air Conditioning Engineers, and The International Institute of Refrigeration. He is a scientific advisor to the Refrigeration Research Foundation.

U.S.-SOVIET SCIENTISTS DISCUSS NORTH PACIFIC FISHERIES

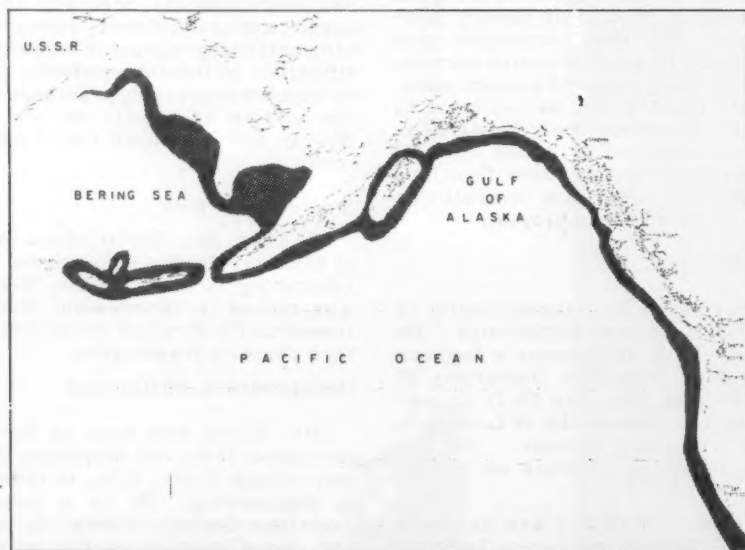
Fishery scientists of the United States and the Soviet Union met in Seattle, Wash., Nov. 15-19, 1971, at the Northwest Fisheries Center (NFC) of the National Marine Fisheries Service (NMFS) to discuss the status of fishery resources in the northeast Pacific Ocean that concerned both sides. Working meetings followed on Nov. 22-23 to summarize details for reports. The meeting was a continuation of annual scientific meetings begun in Moscow in 1966 to exchange catch statistics and biological data.

During the 5-day formal meeting, the scientists exchanged views on the status of Pacific hake, Pacific ocean perch, Gulf of Alaska shrimp, and stocks of two important groundfish species in Bering Sea--yellowfin

sole and walleye pollock. They discussed distribution and abundance of Pacific saury off California, Oregon, and Washington; also, the general biological features of flounder populations inhabiting the coastal waters of California, Oregon, Washington, and British Columbia.

Pacific Hake

Although recruitment of Pacific hake has been at relatively low level, the Soviets reported the second largest catch on record (167,200 metric tons) in 1970, and an increase in catch per unit effort. The U.S. and Soviets agreed that hake stocks in 1970 were similar in size to 1968-69 stocks, and that restrictive measures are not necessary at present fishing level.



Fishery resources (shaded area) of the Continental Shelf in the eastern North Pacific Ocean from northern California to the Bering Sea were discussed in U.S.-Soviet meeting.

Rockfish & Ocean Perch

Based on trawl and acoustic surveys, the scientists agreed, the rockfish populations from northern California to Alaska were about the same in 1970 as in 1969 (about 350,000 metric tons). The size of Pacific ocean perch stocks off Oregon, Washington, and British Columbia remains relatively unchanged, about 40,000 metric tons; current protective measures must be continued.

Shrimp

The U.S.-USSR 1970 shrimp catch was 30,000 metric tons and may reach 45,000 metric tons in 1971. The USSR catch was about 4,700 metric tons in both years. The two sides expressed concern that Gulf of Alaska shrimp stocks may not be capable of sustaining present harvest levels; they agreed on the need for continuing stock-assessment studies.

Walleye Pollack Fishery Grows

The scientists noted the growing fishery for walleye pollock in the Bering Sea and North Pacific Ocean: it now takes one of the largest catches of a single species in the world. The total catch is close to 2 million metric tons; in Bering Sea alone, over 1.5 million metric tons. A large share is taken in eastern Bering Sea and along Aleutian Islands. Despite intensive fishery, no evidence was presented that stocks were being damaged. Soviets reported general increase of this species during past decade throughout northeast Pacific Ocean.

Some improvement was reported for yellowfin sole fishery in eastern Bering Sea, but production is still far below peak years

of 1960-62; then, nearly 500,000 metric tons were taken annually.

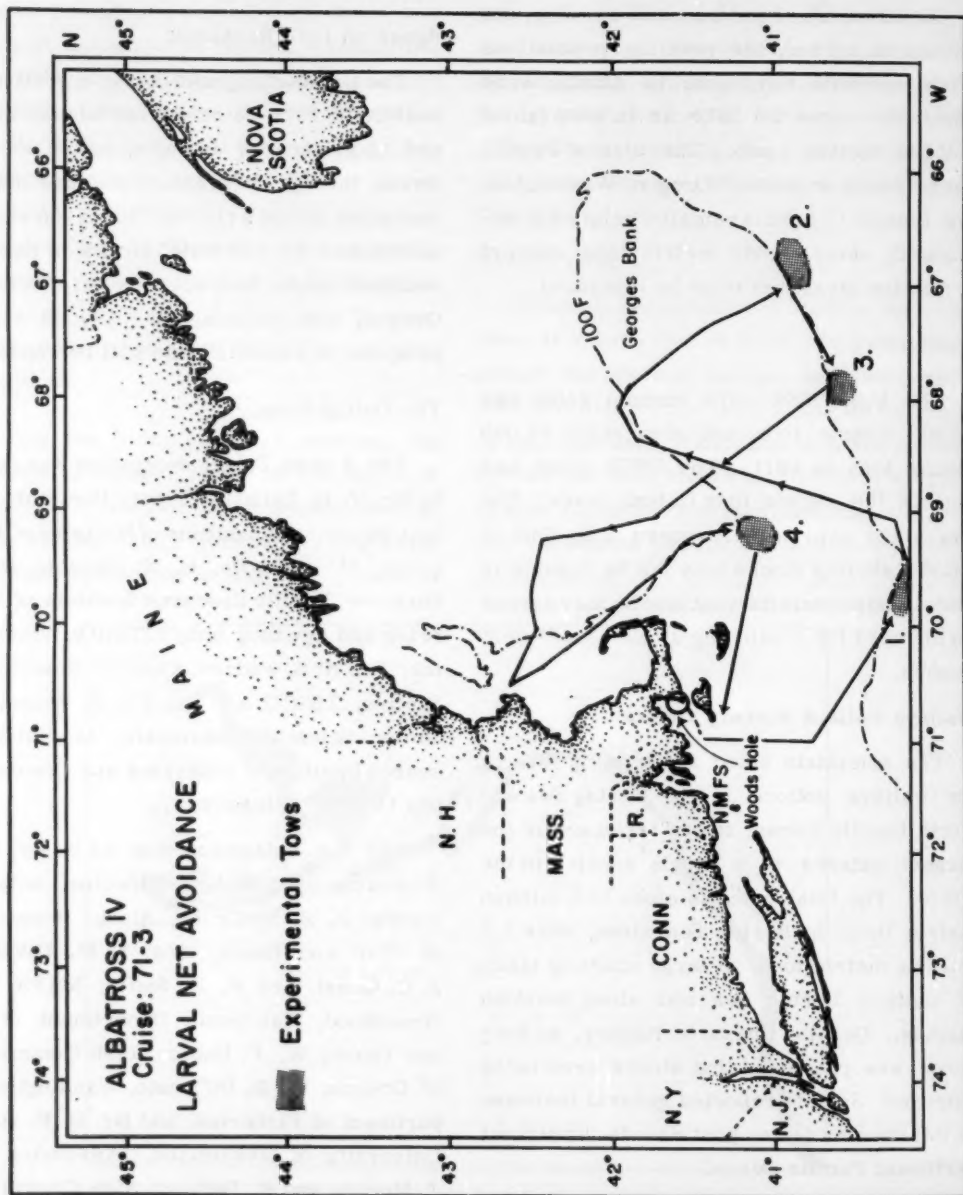
Agree on 1972 Research

The scientists agreed that cooperative research in 1972 be conducted on distribution and abundance of ichthyoplankton off California, biology of juvenile hake, and that cooperative acoustic and trawl surveys be undertaken to estimate stocks of hake and rockfish adults and recruits off California, Oregon, and Washington. A joint tagging program on sablefish also will be conducted.

The Delegations

The 4-man Soviet delegation was headed by Dr. V. G. Lafitsky, Deputy Director, Central Information Institute of Ministry of Fisheries, Moscow; Dr. B. N. Ayushin, Deputy Director, Pacific Research Institute of Fisheries and Oceanography (TINRO), Vladivostok; Dr. N. S. Fadeev, Chief of Biostatistics Section, TINRO; and Dr. YU. B. Ryazantsev, Senior Scientific Associate, All-Union Research Institute of Fisheries and Oceanography (VNIRO), Moscow.

The U.S. delegation was led by Dr. D. L. Alverson, NFC Acting Director, with advisors; J. A. McCrary, Alaska Department of Fish and Game; Drs. F. M. Fukuhara, J. C. Quast, and P. E. Smith, NMFS; E. C. Greenhood, California Department of Fish and Game; W. F. Hublou, Fish Commission of Oregon; G. B. DiDonato, Washington Department of Fisheries; and Dr. D. E. Bevan, University of Washington. Alternates were J. Meehan and R. Demory, Fish Commission of Oregon; J. Reeves and D. G. Gunderson, Washington Department of Fisheries; and Dr. J. C. Olsen, NMFS.



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NMFS TESTS PLANKTON-COLLECTING GEAR

The NMFS "Albatross IV" tested 3 types of plankton-collecting devices in August 1971. The purpose was to study the effect of mouth area, speed of tow, and time of day on avoidance of the gear by fish larvae.

The periodic sampling of fish eggs and larvae constitutes an ichthyo-plankton survey. The collections are counted and the results extended to provide estimates of the size of adult fish populations. These estimates become the basis for the proper use and management of fishery resources.

Such surveys are important parts of the NMFS Marine Resources Monitoring, Assessment and Prediction Program (MARMAP). One MARMAP purpose is to develop techniques for predicting changes in the distribution and abundance of commercially valuable marine animals.

Isaacs Kidd Midwater Trawl (IKMT)

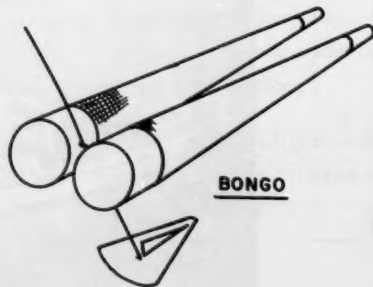
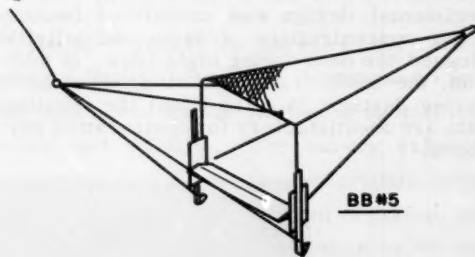
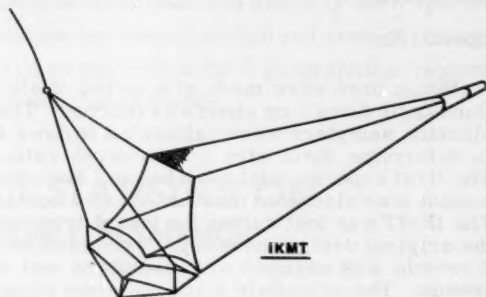
This trawl is spread open by a diving plane at the bottom, and by a horizontal bar at the top. It was designed as a medium-speed device to collect large planktonic animals and small fishes. The original IKMT was a 10-foot-wide (lateral dimension) diving plane; it was called a "10-foot IKMT." The trawl acquired for these trials is a scaled-down version: it has only a 6-foot diving plane. The mouth opening of the 5-sided bag of the 6-foot IKMT are about: top panel, 4.71 feet (1.44 meters); side panels, 5.50 feet (1.68 m.). the two bottom panels, 2.87 feet (0.88 m.) each.

No. 5 Boothbay Harbor Depressor Trawl (BB#5)

The mouth of BB#5 is held open by a rigid, 1-inch steel pipe framework (dimensions: 4.76 feet (1.45 m.) horizontal, 3.28 feet (1.0 m.) vertical). A horizontal, articulated diving plane is used to attain depth for near-bottom operation; this plane is linked to rounded "feet" to cause trawl to lift if firm contact is made with sea bottom. This trawl is designed for use in near-bottom and mid-water operation.

Bongo Plankton Net

The Bongo is a dual-cylinder-and-cone plankton net of conventional design. It is modified by paired collar and net arrangement so the mouth of the two nets tow ahead of the towing line. This arrangement was devised to



eliminate disruption of water-flow patterns preceding the net openings--and possible avoidance reaction by large plankton forms. Leading-edge collars of the Bongo are fiberglass and resin cylinders 2 feet (0.61 m.) in diameter. A "V-Fin" depressor is attached below the collar-net assembly.

IKMT and BB35

Towing bridles of IKMT and BB#5 are arranged to effect a minimum disturbance of water flow in the space ahead of the net openings.

Area of Investigation

Southern New England and Georges Bank (see chart).

Operations

Bongo tows were made at a series of stations until Area 1 on chart was reached. The plankton samplers were calibrated in Area 1 to determine their wire-out-to-depth ratio. The first experimental tows began. Experimental tows also were made in Areas 3 and 4. The IKMT was lost during its initial trial, so the original design involving 3 samplers and 2 speeds was changed to 2 samplers and 3 speeds. The scientists made 109 tows along the cruise track and in the 4 areas. No experimental design was completed because dense concentrations of salps and jellyfish clogged the nets during night tows. In addition, the BB#5 trawl was clogged so badly during daytime in Area 1 that the resulting data are unsatisfactory for comparative purposes.

Results

Although analysis by the preplanned statistical design is not possible, the catches in Area 4 should provide comparisons between the Bongo and BB#5 towed at 3 speeds each during daytime. The data from the other areas and along cruise track should provide an idea of how the gear fished. Such information will be available after the samples have been sorted and the larvae identified.

The depths attained during calibration trials varied considerably from the scientists' predicted depths, but these variations occurred mainly near the southern edge of Georges Bank. They may be related to currents rather than to the action of the depressors attached to the gear. In two instances, the bottom shoaled during tows so that the Boothbay depressor trawl was towing on bottom. Because the trawl is designed to be towed on bottom as well as in midwater, the gear was not damaged; numerous bottom forms were added to the collections of those organisms captured in midwater.

The cruise results suggest that modifications should be made to the gear that would permit sampling at night despite large concentrations of salps and jellyfishes.

For more information, contact Center Director, North Atlantic Fisheries Research Center, U.S. National Marine Fisheries Service, Woods Hole, Massachusetts; or, Dr. Joseph J. Graham, Biological Laboratory, NMFS, West Boothbay Harbor, Maine.



The 'Albatross IV'

SALTWATER ANGLERS INCREASE

In 1970, there were 9.7 million saltwater anglers in the United States, according to preliminary results of the 1970 Saltwater Angling Survey. The survey was conducted for the National Marine Fisheries Service by the Bureau of the Census as a supplement to the Bureau of Sport Fisheries and Wildlife's 1970 National Survey of Fishing and Hunting.

The 1970 number was about $1\frac{1}{2}$ million more than in 1965, when a similar survey showed 8.3 million anglers fishing in U.S. marine waters. The number increased on all coasts from 1965 to 1970, although the greatest increase (22%) was on the Atlantic Coast. In 1970, 5.1 million anglers fished Atlantic Coast

waters; Gulf and Pacific Coast anglers each totaled 2.3 million.

Spend 52% More

The 9.7 million anglers spent \$1.4 billion during 114 million recreation days. This compares with \$800 million for about 96 million recreation days in 1965. Each saltwater angler spent an average of \$146 in 1970, compared to \$96 in 1965--a 52% increase.

Complete results for the 1970 Saltwater Angling Survey will be available in mid-1972. Data on the number and weight of each species caught, by fishing method and area of fishing, will be presented for 7 geographical regions of the United States.

NMFS WILL COLLECT STATISTICS ON SALTWATER SPORT FISHING

A major new responsibility of the National Marine Fisheries Service (NMFS) is the conservation of saltwater sport fishes. Formerly the Bureau of Commercial Fisheries, NMFS long has been responsible for commercial marine species. Collecting catch statistics is vital to a successful conservation program.

Although the commercial catch involves thousands of fishing craft, there are relatively few landing locations. So collecting statistics is fairly easy. The sport fishing record is harder to get. There are millions of saltwater anglers spread over the entire coastline from Maine around to Washington State, and including Alaska and Hawaii.

Census Bureau Survey

Every 5 years, the Bureau or the Census takes a National Survey of Hunting and Fishing sponsored by the Bureau of Sport Fisheries and Wildlife. The survey helps to determine broad trends: geographic areas that are more heavily hunted or fished, and the concentration of sportsmen by income levels. However, the techniques used do not obtain the detailed and accurate figures needed for fishery conservation.

NMFS is working to develop a technique to fill this need. It expects to have one by 1973.

VIMS EXPECTS ABUNDANCE OF BLUE CRABS

Blue-crab catches in the Chesapeake Bay are expected to be over 75 million pounds a year in 1972 and 1973, according to scientists of the Virginia Institute of Marine Science (VIMS). Large hatches in the summers of 1970 and 1971 and good survival of young account for the high abundance.

Virginia and Maryland landings since September 1967 have been between 47 and 67 million pounds per year. These were far below the 1960-70 average of 75 million pounds. The forecast for an increase in catch for September 1971 through August 1972 was made in October 1970 after observations of better-than-average numbers of young crabs hatched in 1970. The 1971 hatch seems as successful as 1970's.

1972 and 1973 Catches

The catches in 1972 and 1973 may not follow the usual seasonal pattern. The fall and winter catch of big crabs, 5 inches wide and larger, has not been unusually high. However, the rivers and bay waters contain countless numbers of 3-4-inch crabs. These are expected to make up a superabundant crop of large-sized peelers and soft crabs in spring 1972, and then produce a very large hard-crab catch in summer 1972.

The 1971 Story

Crabs hatched in lower Chesapeake Bay in 1971 were very late in migrating into the rivers. Normally, the migration of $\frac{1}{3}$ - $\frac{1}{2}$ -inch-wide crabs occurs in early September. But small crabs were not seen in the York and Rappahannock rivers until late October and early November. It is possible that an early normal hatch in June and July 1971 was killed by adverse environmental conditions, such as the low oxygen supplies in the Bay from July through early August, and that the crabs seen in early Dec. 1971 were from a later batch. Crabs smaller than two inches wide were very abundant in the York and Rappahannock river in early Dec. 1971, but almost nonexistent in the James. It is possible, but not likely, that the scientists missed the crop in their James survey. What this means for the 1972-73 James catch is unknown.

MENHADEN CATCH IS GREATEST SINCE 1962

During Jan.-July 1971, the U.S. catch of menhaden was the highest since 1962; 1.3 billion pounds that produced 163,600 tons of fish meal.

Menhaden is the principal species caught by Atlantic and Gulf fishermen. Gulf landings rose substantially.

U.S. production of fish oil also was high during January-July 1971--about 149.6 million pounds, 39% above 1970.

Imports Drop

In that period, imports of fish meal dropped 28% from 1970. In the past 5 years, fish meal import averages have been about 314,000 tons in January-July. Reduced imports caused available U.S. supplies to fall considerably despite the high 1971 U.S. catches.

Prices for menhaden meal fell during first-half 1971 from high of about \$186 per ton in January to a low of \$150 in June, then rose to about \$160 in September.

HAWAIIAN FISH LANDINGS ROSE IN 1970

In 1970, Hawaiian fishermen landed 11.1 million pounds of fish worth \$3.9 million to them. It was an increase of 1.6 million pounds over 1969, due partly to greater landings of skipjack tuna.

There were 333 commercial fishermen working on 82 vessels of 5 or more gross tons; 1,103 commercial fishermen worked on smaller boats or from shore.



NMFS AND ALASKA SEEK TO ENHANCE SALMON RUN

A cooperative study of the suitability--biologic and economic--of increasing pink-salmon runs by mass introduction of fry into Alaskan streams is being conducted by the NMFS Auke Bay Laboratory and Alaska's Department of Fish and Game. Preparation of the site began in July 1971, and it received the first eggs for incubation in November.

The study will continue through at least 3 reproductive cycles. It seeks to increase significantly adult escapements in Auke Creek from the present annual level of 2,200 spawners.

The researchers deliberately limited the number of eggs to be incubated in 1971 to permit natural reproduction to continue during initial evaluation phase of incubators and water supply. If all system components operate dependably, are nontoxic, and capable of producing healthy fry, then the researchers will try to produce one million fry (or more) and marks will be used to evaluate ocean survival.

Eggs in Incubator Boxes

Four incubator boxes, each with about a cubic meter of gravel, were seeded with about 215,000 eyed pink salmon eggs from Auke Creek and 111,000 from Sashin Creek, Little Port Walter. An additional 16,000 eyed eggs from Sashin Creek will be incubated in a screened tray used in fish hatcheries.

The 215,000 Auke Creek eggs are survivors of about 15.5% of the potential egg deposition of the 1971 adult escapement. The remaining 84.5% were spawned naturally in Auke Creek. The researchers will compare fry that emerge from the gravel incubators and fry from the incubator tray with creek fry that migrate seaward from Auke Creek in spring 1972. They will compare size, stage of development, time of emergence, and lipid or energy reserve.

Only the Auke Creek fry will be allowed to migrate to sea. The Sashin Creek fry, which originated from a surplus of spawners in a study at Little Port Walter, will be destroyed to avoid genetic contamination of the Auke Creek pink salmon.

PRECOCIOUS COHO SALMON 'HOME' TO NORTHWEST FISHERIES CENTER

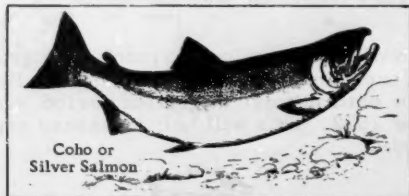
Fourteen marked jack (precocious male) coho salmon of 20,000 yearlings released in spring 1971 "homed" from the sea in fall 1971 to a holding flume at the NMFS Northwest Fisheries Center on the shores of Portage Bay in Washington State. The Center scientists call this return noteworthy for two reasons: (1) The fish had to locate the mouth of an 18-inch pipe emptying into the lake, and to swim 30 feet in darkness; this included a right-angle bend to enter the flume. (2) Six months before, some of the fish had been transported 30 miles from a hatchery. They had been held in the flume as little as 4 hours before release.

Released in Experiments

The marked cohos had been released to determine the effects of transporting juvenile salmon, and the effects of handling, intervals of holding, and release procedures on their homing. The experimental fish were from one of several groups of yearling coho salmon transported early in spring 1971 from a Washington State hatchery. The fish were held at the Center from 4 hours to 7 days before release.

Adults in Fall 1972

The scientists expect the remainder of these fish to return in fall 1972 as full-term adults. They expect the first returns from 100,000 chinook salmon similarly transported, held, and released. Information from the experiments will apply to studies now underway of salmon transportation. It will help establish procedures to operate proposed homing stations for relocated salmon stocks.



Coho or
Silver Salmon

SEEK CHANGE IN JUVENILE CHINOOK'S MIGRATION TIME

Juvenile chinook salmon in Idaho's Snake River migrate downstream in spring. Many of these juveniles do not reach the sea. They die from high concentrations of dissolved nitrogen gas in the rivers caused by heavy spilling at dams.

During the past 2 years, the Idaho Department of Fish and Game has been attempting to increase survival of yearling juvenile chinook by altering hatchery procedures and release time of fish. Biologists of NMFS Northwest Fisheries Center are cooperating in the fish marking. They are assessing by recovery programs the progress of migration.

Fish Size May Be Key

The biologists suspect that the size of fish at release may be a triggering mechanism for their migration. They hope that fish reared to 140 mm and larger by September would migrate in the fall and winter months before high nitrogen concentrations appear in rivers. In 1971, 90,000 juveniles larger than 140 mm were marked and released. At the same time, 60,000 of 95-100 mm (normal size of spring migrants) were treated the same way.

More Work Needed

Experiments have not progressed enough to make valid conclusions, but there is some indication that migration timing of larger fish might be altered. Of the larger marked fish, 700 have been recovered in barge traps on lower Salmon River, 150 miles below release areas; 36 were recovered in traps in turbine intake gateways at Ice Harbor Dam, 400 miles below release area. No smaller fish have been recovered.

NMFS will continue to monitor migrations of young chinook salmon passing Ice Harbor Dam until normal migration period ends in June 1972. This will help to assess experiments.



NOAA PUBLISHES 3-D AIR PHOTOS OF U.S. COASTAL AREAS

NOAA has produced a 99-page book with 45 color photos in stereoscopic pairs of U.S. Coastal areas. It includes New York, Washington, Miami Beach, San Juan, and Honolulu.

Its title is "Color Aerial Stereograms of Selected Coastal Areas of the United States." The Stereoscopic photos, called stereograms, can be examined closely with a simple stereoscope; a foldout cardboard one is included. Shoreline locations, underwater features--channels, sandbars, and submerged rocks--water pollution effluents, geographical and geological features, bridges, and the damaging and corrosive effects of storms and other natural disasters (earthquakes and Hurricanes) can be viewed three-dimensionally.

Each photo has a description, technical data, and a map showing area covered. The book contains an explanatory text and a glossary of technical terms.

Communities Covered

Other communities included are: Salem, Mass.; Harrisburg-Steelton-New Cumberland, Pa.; Beach Haven, N.J.; Ocean City, Md.; Portsmouth, Va.; Georgetown, S.C.; Apalachicola, Fla.; Gulfport, Miss.; Corpus Christi, Tex.; Sausalito, Calif. (including the Golden Gate Bridge); Fort Bragg, Calif.; Aberdeen, Wash.; Turagain Heights, Anchorage, Alaska (including view of 1964 earthquake damage); Wrangell, Alaska; Waikiki Beach, Honolulu; San Juan (old city), Puerto Rico.

How to Order Book

The 9-x 11-inch book can be obtained for \$4.75 from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.



NMFS SURVEYS AMCHITKA AFTER NUCLEAR EXPLOSION

On Nov. 6, 1971, the U.S. detonated a 5-megaton nuclear device on Amchitka Island. Three days later, NMFS biologists-divers from the Auke Bay Center arrived on the island to see what happened. Although bad weather hampered boating and diving operations, they managed to sample the 4 planned stations. Other locations were spotchecked for possible test-related changes. When rough weather prevented diving, the scientists helped in the general inspection of beaches and in collection of dead and injured marine mammals, birds, fish, and invertebrates.

What They Found

They observed few effects on the benthic (bottom) environment. No changes were apparent in density or size composition of sea-urchin populations. They saw no dead or injured animals. The only change was at a Bering Sea sampling site, about 2 kilometers from Cannikin ground zero. There, small pieces had been broken from edges of large patches of live corraline algae.

Disruption of Bottom Substrate

The scientists spotchecked other areas on the Bering Sea side of ground zero. They

found slight-to-moderate disruption of the bottom substrate. The most extensive change was in about 8 meters of water--apparently on or near an active fault line. Blocks of rocks up to 3 meters or more in diameter had been broken off bedrock outcrop and been tumbled. The freshly fractured surfaces of rocks were exposed. Still-living algae (*haminaria* sp. and others) were on the undersides of some large rock fragments. Apparently some large blocks were broken off and tossed into inverted positions. So algae that had been growing on upper surface were now on shaded lower surface.

Limited Sampling Program

The scientists concluded: "The results of the underwater surveys do not indicate any catastrophic changes resulting from Cannikin, but we should consider this in light of the limited nature of the sampling program. Because of the poor underwater visibility and the difficulty the divers experienced in moving about, they were able to inspect only a few very small areas carefully. More extensive underwater surveys may disclose additional areas of substrate disruption and possible biological damage."



ALASKA's NORTH SLOPE

A New Factor In Fisheries Management

George L. VanWyhe

Alaska's North Slope and Interior contain enormous fishery resources which must be considered in any plans for developing the oil of the Arctic area.

Fishery resources which may be affected by the oil development and pipeline construction are of tremendous economic and recreational value and there are also subsistence fisheries of significant importance to Alaska's native population.

Chum salmon, lake trout, grayling, Arctic char and all five species of whitefish are of importance as sport, commercial or subsistence species on the North Slope.

While it is recognized that oil development may have considerable influence on North Slope fisheries, the total impact will not be known until construction methods are identified for each ecological area involved. There are, however, important ecological aspects to consider in the preliminary design and planning of construction.

Of major concern to the fishery manager is the need for great amounts of gravel for building roads and the pipeline pad. Most of this gravel has to come from stream beds as these are the only gravel areas readily available. The impact of gravel removal could vary from minimal to disastrous, depending on method, time and specific area of removal.

Stream crossing designs should include provisions to establish proper seasonal time of construction and great care should be taken to protect spawning, rearing and overwintering areas of the region's fish. Appropriate timing of work activities and enforcement of stipulations which will prevent obstructions and severe siltation will minimize the problems of stream crossing.

New surface means of angler access provided by the construction access road and associated bridge construction will create considerable impact on the sport fisheries

north of the Yukon River. If the public is allowed to utilize the access construction road and some means of crossing the Yukon River is available, angling pressure in the northern area could increase by as much as 50,000 angler days per year. Already angler use and harvest has increased several thousand per cent since oil discovery in some waters.

The use of tracked vehicles causes long-lasting effects on the tundra which are a major concern to biologists and conservationists alike.

The effect of destroying the vegetative cover on the tundra is well documented on the North Slope. One extreme example is the draining of entire lakes when thawing and slumping of old vehicle trails creates a drainage ditch. Strict enforcement of regulations pertaining to the use of cross-country vehicles is required if the water drainages of the north country are to remain as suitable fish habitat.

The factor which will have the greatest impact reduction on fisheries will be the vigorous enforcement of measures and stipulations designed to protect these living resources. All land-holding agencies use the same regulations and these regulations are strictly enforced, the construction stipulations then and only then will provide for orderly development.

The north slope oil development, with proper design and planning, can have an important, long-range beneficial impact on resource management. This anticipated benefit will spring from the establishment of regulations and stipulations which will allow other nonrenewable resources throughout Alaska to be utilized. It is also probable, because of the large expected revenue return, that the oil industry can be expected to devise construction and exploration practices that can be adapted to exploitation of other resources in Arctic climates.

Mr. VanWyhe is Regional Supervisor, Sport Fish, Fairbanks, Alaska Department of Fish and Game.

Reprinted from Alaska Fish & Game, Sept.-Oct. 1971.



THE NORTH SLOPE--and the proposed 800-mile pipeline that would carry its oil (estimated 50 billion barrels) to Valdez.

The Department of Fish and Game is making special studies to determine the extent of fishery resources of the North Slope and the impact which the oil development will have on them. Results of these studies will play an important role in establishing construction guidelines required to protect the North Slope's valuable fishery resources.

Engineers can only design minimum impact construction plans based on the quality and quantity of biological input. The fishery biologists of the Sport Fish Division have ahead of them the task of determining the fragile areas in the respective life histories of North Slope fishes and logical and realistic ways to provide protection.



U.S. GREAT LAKES COMMERCIAL CATCH DROPS ABOUT 10%

Commercial fishing in the Great Lakes waters of 4 states--Michigan, Ohio, Pennsylvania, and Wisconsin--yielded 47.4 million pounds through August 1971, about 5 million pounds below the 1970 period (52.4 million). In 1970, the catch for these states was 67.8 million pounds, 96% of total production of the 8 lake states--70.4 million pounds.



The 1971 decrease in U.S. landings results primarily from declines in several major species, particularly alewives and chubs. Another factor was some restrictive measures in Lake Erie waters following mercury contamination. According to monthly catch statistics of the National Marine Fisheries Service for these states, the alewife harvest

same proportion as for the first 8 months in 1970. Chub landings for lakes Michigan and Superior fell 35%, 2.4 million pounds, from 1970.

The catch of whitefish in the upper Great Lakes has increased about 58% from 1970; the Michigan-Wisconsin catch rose from 1.5 to 2.4 million pounds. This species has commercial importance: the landed value of 1971 catch through August was \$1.2 million, 40% by value of all species caught in the lake waters of Michigan and Wisconsin.

Mercury Poses Problem

The discovery of mercury in western Lake Erie resulted in a ban on commercial fishing for walleye in Michigan and Ohio waters in spring 1970. On May 8, 1971, Ohio banned white bass. Restrictions are limited to these fish, but the publicity reportedly has had an adverse effect on the market for other species caught at the western end of Lake Erie. Lake St. Clair, where mercury contamination was first discovered, is closed to commercial fishing in U.S. waters.

8 Months in 1970

Here are summaries of the commercial catch through August 1970 and 1971 in thousands of pounds:

State	1970	1971	Species	1970	1971
Michigan	14,790.5	11,633.6	Alewives	29,045.7	26,072.1
Ohio	6,530.2	6,870.6	Chubs	6,822.9	4,409.7
Pennsylvania	419.9	210.9	Carp	5,520.4	5,619.6
Wisconsin	30,723.0	28,722.9	Yellow perch	2,511.4	2,415.5
Total	52,463.6	47,438.0	Whitefish	1,536.8	2,428.4

of 26 million pounds by Lake Michigan trawlers was about 3 million pounds below 1970 figure (see table). In 1967, the peak year for this species, the figure through August was 33.2 million pounds. In 1971, the alewife accounts for 55% of the 4-state total; this is the

A breakdown of the 4-state data by lake basins shows these respective 1970 and 1971 catches in 000s: Lake Michigan: 41,226 and 35,733; Lake Erie: 7,370 and 7,254; Lake Superior: 2,116 and 2,474; Lake Huron: 1,751 and 1,976.



NMFS FISHERY INSPECTION IS ADAPTABLE TO A PLANT'S NEEDS

New regulations in Commerce Department's Voluntary Fishery Products Inspection Program make it possible for inspectors of the National Marine Fisheries Service to inspect a plant according to its individual needs. A plant that needs only part of an inspector's day or 2-3 inspectors will get what it needs.

The program provides impartial inspection and certification of processing plants and products. It is based on sanitary requirements for plants and U.S. standards for products.

During 1970, 60 NMFS inspectors certified about 335 million pounds of fishery products--27% of total annual production of processed fishery items.

Reasons for Changes

NMFS Director Philip M. Roedel said that primary changes in the regulations are based on technological advances. The changes avoid duplication of effort in plants that have developed effective quality control. Before

the rule changes, a fishery products inspector was assigned full time to a single plant.

"The inspection needs of a plant depend on many things--size, complexity of operation, the product or products being manufactured. In many cases, a small plant or a simple operation does not require a full-time inspector. In other cases, the one plant-one inspector rule may result in inadequate inspection for a large or complex operation," he noted.

Other changes will bring closer together plant sanitation requirements with FDA's Good Manufacturing Practice (GMP) regulations.

Useful Service

Purchasers of fishery products for schools, cafeterias, restaurants, or chain stores will find NMFS inspection a convenient method to make sure that a product meets bid specifications.

Firms that use the inspection service can use the official Department of Commerce inspection marks on brand labels.

INSPECTION and CERTIFICATION GUARANTEE QUALITY



The Slimier It Is, The Faster It Swims

The slime of barracudas, halibut, and other fast fish contributes appreciably to their speed, a Navy scientist has found. The skin slime of the Pacific barracuda can cut water friction as much as two-thirds (65.9%). This research on marine and freshwater fish was conducted by Moe W. Rosen and his assistant, Neri E. Cornford, U.S. Naval Underseas Research and Development Center, Pasadena, Calif. The Navy long has been concerned with the subject of what speeds aquatic animals through water.

Porpoises as Background

Researchers used to think that porpoises swam faster than their body shape and muscle strength should allow. They suspected that the porpoise's skin was resilient and flabby enough to cut the water's turbulence and so cut the drag. Some researchers even talked of equipping the hulls of submarines with a flabby covering.

However, research in recent years has indicated that porpoises are strong enough--without any special skin characteristics--

to propel themselves through the water at the speeds researchers recorded them.

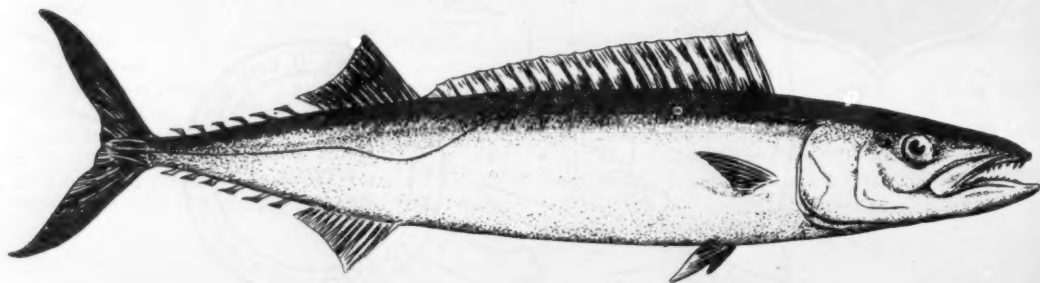
The Navy Study

The Rosen-Cornford research indicates that the slime on many (but not all) fish reduces turbulence at high speeds. Barracudas have been clocked at 28.3 miles an hour. Rosen calls this "very fast for an aquatic animal."

The slime's efficiency in cutting turbulence seems related directly to a species' need for speed to survive. The barracuda is streamlined predator. The halibut's slime is nearly as efficient as the barracuda's; the halibut catches fish "by means of long, swift lunges".



Halibut



Barracuda

Freshwater Species

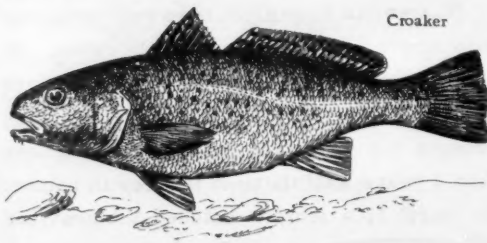
Of the freshwater species studied, the slime of the smallmouth bass was very effective. A little less efficient was the slime of rainbow and brown trout, white crappie, and bluegill.



Rainbow Trout

Exceptions to Rule

There were significant exceptions to all this: the slime of fish that do not need speed contributed little to reducing friction. In this category were the white croaker, an eater of slow-sea life, and the hagfish, an eel-like scavenger.



Croaker

Other exceptions are the mackerel and the California bonito. These swift fish ooze a slime that helps little in cutting friction.



Pacific Mackerel

The nut-brown cowrie, a mollusk, has a friction-reducing slime. Researchers presume this lubricates the soft body's movement within the shell.

Functions of Fish Slime

Fish slime is believed to have other important functions: it guards against bacterial infection and lubricates scales as body flexes.

Rosen uses the word "reluctance" to describe the special characteristic of the slime on those fish that need it for speed. This property is the reluctance of slime to dissolve in water until "agitated by turbulence." As the fish wanders about at moderate speed, the slime remains intact. But when it attacks--or is itself being chased--the resulting water turbulence along its body starts to dissolve the slime. This cuts friction--and the turbulence.

Barracuda Slime Very Effective

With barracudas 26 to 31 inches long, the slime was very effective. A concentration of under 1% cut friction 44%. However, when heavily concentrated, slime efficiency falls.

Small-Fish Behavior

About a dozen years ago, Rosen found that several small fishes, when swimming, use the turbulence they produce to propel themselves. The fish's swimming action "generates a whirling vortex within the concave part of its flexing body." Then the fish pushes against this vortex to propel itself forward. Rosen suspects that large fish that do not have friction-reducing slime may propel themselves similarly; the bonito is an example.

LOBSTERS CAN BE RAISED IN HATCHERIES, EXPERT SAYS

The supply of lobsters may never catch up with demand. A possible solution is to raise lobsters commercially. This was the belief expressed by John Hughes to the New England Marine Resources Information Program. Hughes, a leading authority, is Director of the Massachusetts State Lobster Hatchery and Research Station at Oak Bluffs.

Not only can this be done, he says, but the very nature of the lobster may make this the only practical method of ensuring supply.

The Oak Bluffs hatchery opened in 1951. Since then, he and a colleague, J. J. Sullivan, have raised and released millions of young lobsters. Hughes says: "Considering the lobster's life history, it's amazing as many of them make it to the dinner table as do." Only within 48 hours of the female's molt do lobsters mate. Adults shed their shells "perhaps only every 2 years." Also, certain size limitations affect successful mating.

In the Beginning

The female produces as many as 60,000 eggs. It takes 18 months from copulation to release the eggs as baby lobsters. One-third-inch long, they resemble the larvae of mosquitoes more than lobsters. They float on the surface during their first 3 larval stages. They are helpless prey for fish, other lobsters, and birds. Of the 60,000, possibly 60 survive the first 3 weeks to reach fourth stage. Sexual maturity and one pound in weight are 5 to 7 years away.

So the primary aims in lobster culture are to speed growth and to increase the survival rate of baby lobsters. Hughes has done both.

The State Hatchery

Egg-bearing females are put in hatching tanks with running sea water. When the fry hatch, they are collected in 3,000-unit batches and placed in Hughes-designed rearing tanks. These tanks reduce 2 activities: the infant lobsters' cannibalistic tendencies; their diet of finely ground clams or brine shrimp. Lobsters, not scavengers, prefer fresh food. They reach the fourth molting stage and readiness to be released. Using mass-culture techniques, Hughes has increased survival rate from $\frac{1}{10}$ of 1% up to 40%.

Hughes has shown that the water temperature appreciably affects growth rates. He and Sullivan built a temperature-control tank to keep water at 70° year round. They brought the young to one-pound size in less than 3 years, half the time it takes in nature. By April 1, a lobster hatched the previous November and reared in heated water was 6 times as large as sibling reared elsewhere. Also, female eggs kept in heated water hatched 3 months early.

Genetic Factors

Hughes is interested in the possible effect of genetic factors on growth rates. Selective breeding could yield strains of relatively

rapid-growing lobsters. He has experimented with selective breeding of other desirable traits. Sometimes, lobsters have outsize claws or 2 crusher claws instead of one crusher and one ripper. The crusher has more meat than the others. Hughes would like to rear a 2-crusher strain.

Color mutation, too, is desirable. Occasionally, albino, red, and blue lobsters occur in nature. Hughes has bred a red with a normal green and obtained 50% red offspring. This would help track released lobsters for future population studies. Because lobsters molt regularly, it is virtually impossible to tag them permanently.

Reproductive Habits

Hughes was probably the first researcher to measure the gestation period. He discovered that a female who molts and mates in spring will hatch her eggs the following spring; a female who mates in fall holds them 18 months. In 1965, he produced a successful mating in the laboratory--and the fry reproduced in captivity.

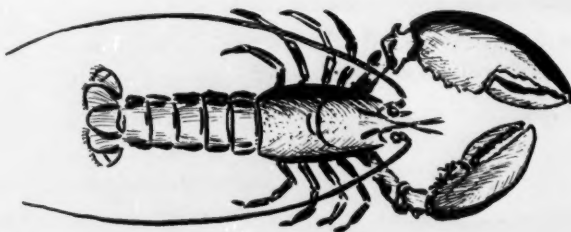
Mating

Hughes found that while the male "approaches the first female to whom he is presented with exemplary ardor, he is considerably less enthusiastic if presented to a second lady the same day and downright indifferent to a third."

He documented size limitations in mating. Invariably, a large male fails to mate with a much smaller female; but a small male can mate successfully with a much larger female. Some researchers say mating can occur as late as 12 days after the female molts. In Hughes' experience, 48 hours is more accurate for the female, although males can mate successfully up to 5 days after molting.

The Future

Hughes believes that there is a good chance of lobster farming becoming a reality in the years ahead. "I expect we'll know an awful lot more about it next year than we do now."

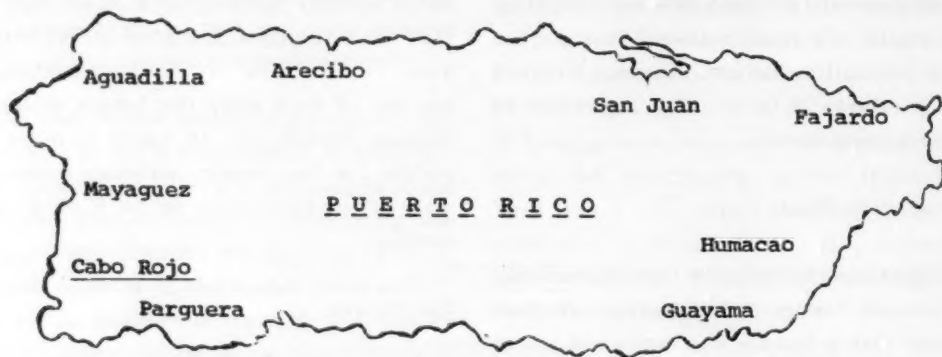


PUERTO RICO TO HAVE UNDERSEA LAB IN 1972

Puerto Rico will have an international undersea laboratory in September 1972, Gov. Luis A. Ferre has announced. This marine research and development project--the Puerto Rico International Undersea Laboratory (PRINUL)--will consist of a habitat and a research program in coastal-zone management and environmental protection. PRINUL is an extension of the Tektite I and II programs of 1969 and 1970.

habitat for marine investigations. It will be available to scientists and engineers from government, industry, and universities in the U.S. and abroad.

The lab will provide accommodations for off-island concerns interested in testing and evaluating equipment and systems. It is expected to attract to Puerto Rico industries that can use these facilities. Also, PRINUL will be involved in projects dealing with oil



Gov. Ferre hopes that "the laboratory will attract to Puerto Rico technical projects from all over the United States and other countries, as well as industrialists and scientists specializing in related fields. This project is the initial step in establishing Puerto Rico as a world leader in the development and utilization of one of its most valuable assets: its marine resources."

What PRINUL Is

PRINUL will explore the Caribbean's submerged platforms for potential resources that can be developed for Puerto Rico's benefit. It will train scientists in using a

contamination, operating techniques, construction, and surveys--and with underwater physiological and psychological problems.

Scheduled for Sept. 1972

A 38-acre tract along the southwest coast of Puerto Rico, near Cabo Rojo, is the physical site of PRINUL. However, the lab is designed to be completely mobile and able to operate anywhere. It is centered around a self-contained habitat designed to function in 100 feet and provide a base for excursions to 300 feet. It can be relocated in less than an hour. The habitat is two 20' X 8' horizontal cylinders built within a barge.

OREGON STATE UNIVERSITY AIDS AMERICAN SAMOA

A 4-man Oregon State University (OSU) Sea Grant team is helping the natives of American Samoa to build hydraulically equipped dories and to use them for fishing.

The 3-month project is financed by a grant from the Office of Economic Opportunity. R. Barry Fisher, project head, said: "At the end of the project in Spring 1972, we hope to leave behind 5 native-built and equipped dories, nucleus of a fishing industry, plus a boat-building capability, an engine installation and repair capability, a fishing gear development program and a Sea Grant proposal to set up an extension program to help the fisherman and the consumer."

Fisher is associate professor of fisheries, OSU Department of Fisheries and Wildlife, and a former East Coast commercial fishing captain. He is gear development technician for the project. Other members are: Ted Howe, Newport, OSU's master fisherman; Cliff Roop, commercial fisherman and marine engine mechanic, Salem, and Tom Duncan, master fisherman, Newport.

American Samoa has been an American protectorate since 1911. It has 28,000 resi-

dents, 5,000 of them in Pago Pago, the capital, one of the Pacific's finest natural harbors. Tuitila is the main island.

The Project

The team will build 5 prototype Pacific City (Oregon) dories in a converted government building in Pago Pago. It will teach Samoans boat building and hydraulic and gear installation, then train them to use the equipment. It will cooperate with the Samoan Department of Marine Resources to develop fishing gear.

Fisher added: "Among the spin-offs, we hope, will be the fact that Samoans go into business building boats.

"We would like to see every interested village be able to catch fish for two basic reasons: Provide a source of high quality protein for the villagers and make possible the sale of fish in the open market as cash income."

Fish is a favorite food of Samoans. Species include skipjack tuna, yellowtail tuna,

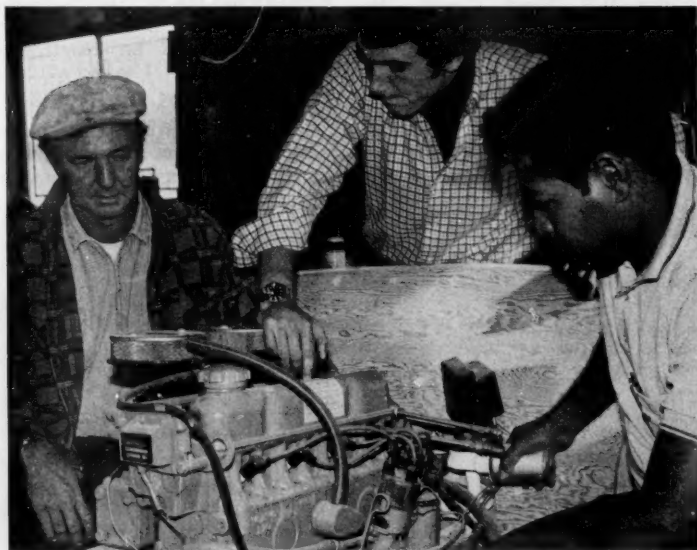


Fig. 1 - Three leaders in Oregon State University Sea Grant project for American Samoa lookover a 130-horsepower engine installed in a new Pacific City dory in Oregon. From left: R. Barry Fisher, project leader; Steve Ritterbush, Pago Pago, assistant to head of Department of Marine Resources in American Samoa; Sam Pulelasi, vocational adviser, Department of Education of American Samoa.

bottom fish, snapper, rockfish, perch, cravelle jacks, and parrot-fish. Periodically, pelagic fish like dolphin, wahoo, mackerel, and marlin are available.

Fisher added: "Historically, fishing was an important part of activities in Samoa. But it dwindled in importance as the society became Americanized and today the islands are no longer self-sufficient in fish."

It is hard to determine how much fish is imported, but every grocery sells canned salmon, salt mackerel, and frozen bottom fish from New Zealand and Australia.

Taiwanese and Korean fleets carry fish to American Samoa canneries owned by U.S. companies. These are the only significant private employers of Samoans.

Fisher emphasized: "Key to the whole Sea Grant project is the concept of a low cost boat with high speed and productivity through developing some gear and hydraulic pulling power to harvest the resources."

PACIFIC CITY DORY

He chose the Pacific City dory because of its stability, speed, and ruggedness. It is widely used on the U.S. West Coast. In Samoa, two keels will be added to the flat bottom to give it more bite in the ocean and to protect it against reefs. The fishbox will be insulated to carry ice for fish preservation.

An awning will be added to protect crew from rain and sun. Each 2-man crew will

help build and equip their boat so they will know how to take care of it. The boats, worth about \$4,500, will be owned by villagers or private fishing associations.

The crews will be trained in Pacific Northwest-style tuna trolling; Tahitian pole-and-line fishing for tuna; hand lining for bottom fish, using various gear including Portuguese long lines; Norwegian jigging gear, and bait fishing and gill nets for spiny lobsters, bottom fish, and schooling pelagic fish.

Each dory will be built from a master jig with a $\frac{3}{4}$ -inch laminated plywood bottom. It will have $\frac{1}{2}$ -inch plywood sides, a small fore-deck, and a console fishbox. A South Pacific wood, dakua, will be used for framing. It will be fastened with epoxy glues, galvanized bolts, and silicone bronze ring nails and screws.

At Pacific City, a boat is turned out from a master jig without deviation. It takes 2 men 5 days to finish a boat. In American Samoa, it will take 10 days because of training in each step.

The dories will be powered with Volvo-Penta Model 270 130-horsepower inboard-outboard engines. They will be equipped with VHF telephones for communication and as a homing device to illustrate the idea of cooperative fishing of several boats. The dory's hydraulics will be Northwest Pacific-style tuna pullers. These will be used to pull pelagic fish caught trolling.

Complete studies and earnings records will be kept to assist Samoan fishermen in obtaining private financing.



Fig. 2 - The Pacific City Dory.

FISHERIES OF THE VIRGIN ISLANDS

Willard N. Brownell

The northeastern Caribbean from Puerto Rico to Antigua has been extensively explored during the past 10 years by various interests seeking to locate exploitable stocks of fish. From a large-scale commercial standpoint, these efforts have been fruitless. Consistently small catches have been reported by the Puerto Rico Department of Agriculture, the UNDP/FAO Caribbean Fishery Development Project, the Japanese fishing operation based on St. Martin, and the National Marine Fisheries Service following exploratory cruises.

Plankton productivity is very low in this region relative to known productive fishing grounds of the world. Hargraves, Brody, and Burkholder (1970) have shown that nutrients are extremely limited due primarily to sparse runoff from the islands, lack of upwelling, and unfavorable currents that carry nutrients out of the region).

The Problems

Given the restricted natural productivity of the area, the effects of man-imposed limiting factors are intensified. Minor fishing pressure from handline and pot fishing efforts already appears to have diminished the stocks of reef fish in the shallow shelf waters south of St. Thomas, where much of the small-boat Virgin Islands fleet operates. Pollution from dredging, municipal sewage, garbage dumping, and oil spills has rendered the marine environment intolerable for most commercially important fishes around several bays of the south coasts of St. Croix and St. Thomas. The reclamation of shallow bays and mangrove forests for residential, resort, and industrial development poses an ever-increasing threat to the fisheries. These protected areas, so important as nurseries and feeding grounds for fish and shellfish, are methodically being destroyed in the Virgin Islands by man-induced siltation and filling.

Mr. Brownell was associated with the Caribbean Research Institute, St. Thomas, Virgin Islands.

This study was conducted in cooperation with federal assistance programs of the National Marine Fisheries Service (Public Law 88-309) and Bureau of Sport Fisheries and Wildlife under Dingell-Johnson Program. The V. I. Government provided matching funds.

Ciguatera Fish Poisoning

The fishing industry in the northeastern Caribbean (and especially the Virgin Islands) is further hampered by the problem of ciguatera fish poisoning. Ciguatoxin builds up over a period of time in the muscle and viscera of fish representing a broad range of species, feeding habits, size, and geographical location in the tropics. Often two fish of the same size and species caught in the same pot will produce debilitating illness in all people who eat one fish--while those who eat the second experience no harmful effects at all. Individuals of all commercially important bottom fish in the northeastern Caribbean have been reported as occasional or common carriers of ciguatoxin (Halstead, 1970). Though toxic fish are uncommon, many restaurants and even local housewives are unwilling to run the small risk of contracting the severe nervous system disorders precipitated by unintended consumption of a ciguatera-carrying fish. Despite many years of investigation in the Virgin Islands and Hawaii (the problem is more serious around some Pacific Islands), it is impossible to tell (except through feeding and bioassay tests that are sometimes inaccurate) whether or not a fish is toxic. Indeed, the chemical nature of the toxin and its source at the beginning of the food chain have not even been clearly defined. Robert W. Brody at Caribbean Research Institute is working on the toxicology and epidemiology of ciguatera in the Virgin Islands, with Sea Grant financial support.

Modern Fishing Methods Handicapped

Modern high-yield fishing methods cannot be used in the Virgin Islands. Purse seining is useless because schools of pelagic fish are small, scattered, and not confined by thermal boundaries. Trawling of any sort is impractical because the fish populations are

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dispersed and the good bottom habitats are huge jagged coral formations, steep irregular slopes, or mounds and canyons of rocks and coral. Longlining is susceptible to severe tangling amidst the rocks and coral, and pillaging by sharks, unless the gear is designed for large, aggressive species.

Fishing in the northeastern Caribbean is done almost exclusively from 16-22 ft. open boats with outboard motors. Most fish are caught by handlining or pot fishing. Power haulers and depth finders are seldom used. Marketing systems, shore support facilities, and cooperative activities are virtually nonexistent. Swingle, Dammann, and Yntema (1970) report that 400 individuals in the U.S. Virgin Islands earn at least part of their livelihood from fishing. Most fishermen hold down at least one other job. The market potential would allow a great deal more income from fishing if it were possible to locate greater stocks of nonciguatotoxic fish and to equip fishermen for catching them more efficiently.

RECENT DEEP WATER FISHERY RESEARCH

Exploratory fishing accomplished through the Caribbean Research Institute (CRI) on St. Thomas and the UNDP/FAO Caribbean Fishery Development Project (CFDP) on Barbados in 1970 and 1971 indicates that commercially exploitable populations of snapper and grouper exist along the shelf margins of the northeastern Caribbean islands. The CRI work was done around the periphery of the northern Virgin Islands shelf and St. Croix (see map), primarily with multiple hook-line rigs on mechanical reels. The most successful CFDP explorations were realized on the northern edges of Saba, Anguilla, and Barbuda banks, using Z-type Antillean fish pots. Efforts around the rest of the islands of the Greater and Lesser Antilles generally yielded poor catches.

Fishing In Dropoffs

The resident shelf-edge snapper and grouper populations are concentrated around the slopes and cliffs of the dropoffs in 30 to 200 fathoms (see graph). The methods used for fishing in this situation (pots, long lines, and mechanical reel hook-line) have severe limitations. Rough seas, rapid drifting, and the infeasibility of anchoring make all three

types of gear very difficult to set within the narrow limits of the steep shelf slopes. Hookline fishing is fairly efficient if the wind is right either for drifting parallel to the shelf margin or for anchoring up on the top of the dropoff. The latter method can waste much time if none of the scattered schools happens to be near the boat. Pot fishing is the most productive in areas where the slope is less than 60 degrees. Well-baited pots that remain stationary on the slope will commonly catch 50 lbs. of fish or more per 6-12 hour set. Longlining can also be productive in sets of short duration on the gentler slopes, if the boat has a good crew and power hauler. Unfortunately, there are very few locations around the northeastern Caribbean island shelf margins that are not too steep for set gear fishing. Only about one-third of the total shelf slope area around the Virgin Islands is conducive to long-line or pot fishing.

1314 Fish Tested

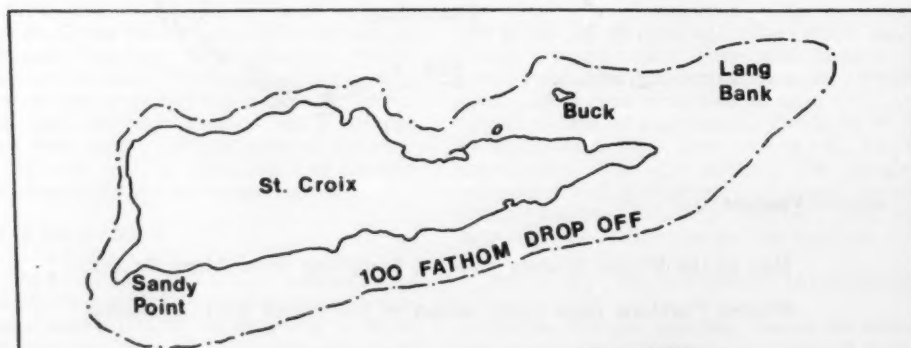
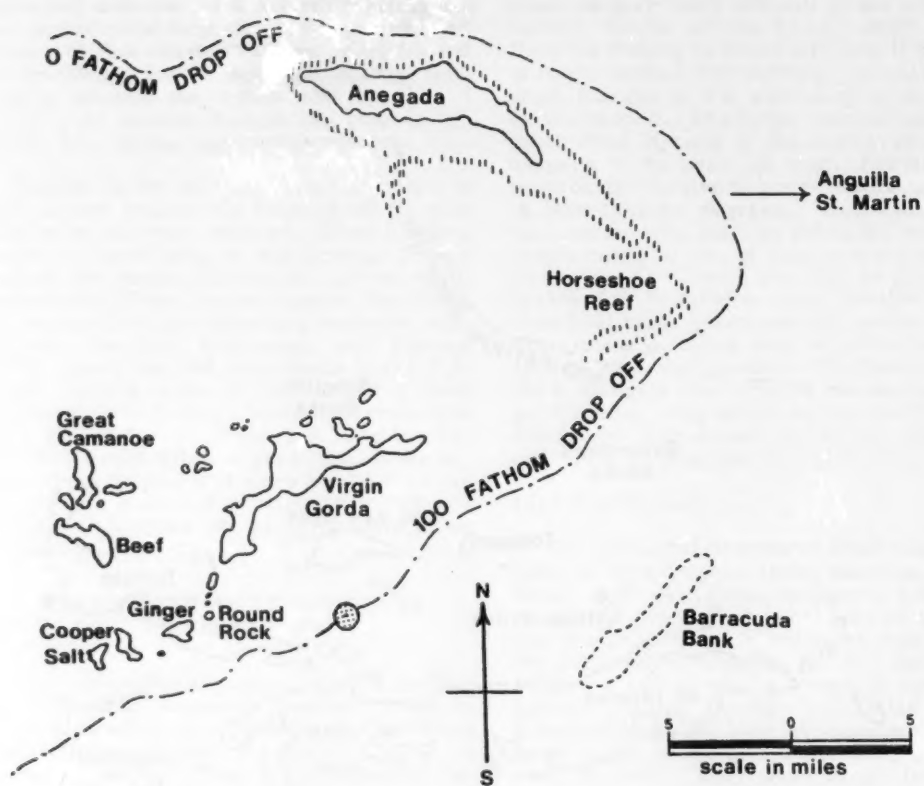
The principal deepwater shelf slope species in this region (silk, blackfin, voraz, black, and vermilion snappers, and misty groupers) are considerably less prone to be ciguatoxic than their relatives that inhabit the shallow shelf waters. Of 1314 deepwater snappers and groupers tested by the Virgin Islands project through controlled human consumption, only four were toxic. All four were large, old fish (3 were misty groupers over 25 lbs.). They were caught (see map) where the shallow-water species are known to have a high incidence of ciguatera (Brownell and Rainey, 1971). The CFDP has marketed tens of thousands of silk and vermilion snapper from the Caribbean with no reported incidents of poisoning. The other species under consideration have always been eaten extensively throughout most of the region. This has resulted in only very occasional cases of ciguatera. Because of their exceptional taste, fine texture, culinary versatility, and eye appeal, the deepwater snappers and groupers command premium prices on the sparsely supplied local markets and the hotel-restaurant circuit.

DEEP WATER COMMERCIAL FISHES

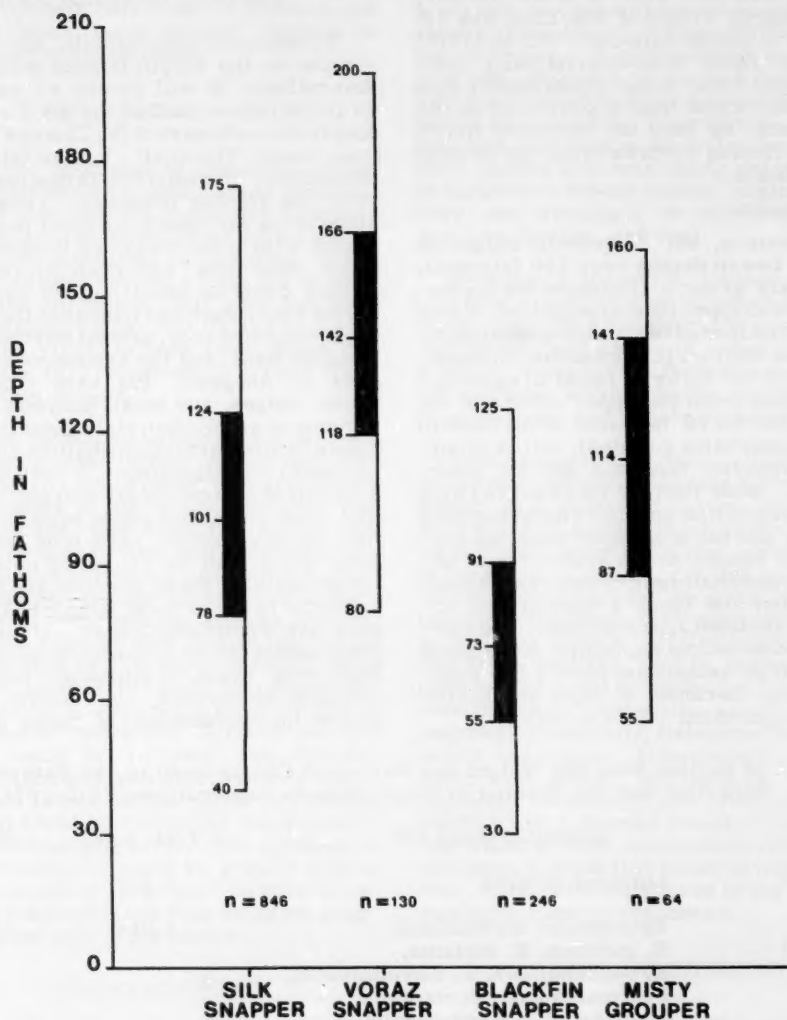
In the Virgin Islands, the most abundant commercial species around the shelf margins is the silk snapper (*Lutjanus vivanus*); this ranges from 40 to 175 fathoms (see graph). Blackfin snappers (*Lutjanus buccanella*) are abundant in a shallower domain (30 to 125



Map of the Virgin Islands Showing Sampling Area Along Dropoff.
Shaded Portions Represent Areas of Encounter with Ciguatera.



St. CROIX
(40 miles due south of St. Thomas)



Depth Distributions of Four Virgin Islands Deep Water Fishes. Lines Represent Total Range, Shaded Bars Indicate One Standard Deviation on Either Side of the Mean. The 64 Misty Groupers Include 16 Caught on CFDP Cruises in the Northeastern Caribbean in 1970.

(From Brownell and Rainey, 1970)

fathoms). Since most exploratory fishing in this project was done in 60 or more fathoms, the percentage by weight of blackfins was not as great as might be expected. Rivas (1970) showed that these characteristically deep water snappers may range occasionally into even shallower water than encountered in the Virgin Islands. He used the extensive NMFS exploratory fishing records from the central western Atlantic.

The Fish Caught

Less common, but frequently caught in deep water (mean depths over 100 fathoms), are the misty grouper (*Epinephelus mystacinus*), queen snapper (*Etelis oculatus*), voraz snapper (*Pristipomoides macrophthalmus*), and blackline tilefish (*Caulolatilus cyanops*). Of these, only the voraz is found in aggregations. Catches from the upper waters of the shelf edge (40 to 60 fathoms) often contain red hind (*Epinephelus guttatus*), yellow groupers (*Mycteroperca venenosa* and *M. interstitialis*), sand tilefish (*Malacanthus plumieri*), vermilion snapper (*Rhomboplites aurorubens*) and black snapper (*Apsilus dentatus*). Also caught are a scattering of assorted jacks and shallower-water reef fishes. The vermilion and black snappers are encountered in isolated aggregations. The vermilion and voraz snappers, though sometimes caught in large quantities, have a low commercial value because of their small size (average weight about 1 lb. for both).

PROBLEMS AND PROMISE OF FISHERY DEVELOPMENT

To succeed economically, any fishing operation in the Virgin Islands will have to be diversified. It will use as a focal point the 40 to 150 fathom band at the shelf edge extending from northwest of St. Thomas to Anegada (see map). The shelf slope in this region is productive. Perhaps this is due mainly to the very low fishing pressure. Generally, this slope is not very steep, so most places can be fished with pots, longlines (bottom and vertical), hook-line, and even gill nets. These efforts could be supplemented with pot fishing for reef fishes and lobster in the shallower shelf waters nearby, around Barracouta Bank, Kingfish Bank, and the expansive reefs in the area of Anegada. Pot sets close to patch reefs, ridges, and small canyons in 10 to 30 fathoms of water often yield good catches; the fishes in this particular shallow area are not inclined to be ciguatoxic. A boat fishing consistently at this northerly margin of the shelf will also encounter some schools of pelagic fish, mainly dolphin, little tuna, and blackfin tuna, which can be caught by pole and line. Unfortunately, these grounds are beyond the practical range of most native boats, and the seas are commonly rough. Since the local government offers virtually no assistance for improving boats, equipment, methods, and handling techniques, the native fishermen cannot take advantage of these grounds!

Species of Bottom Fish (By Weight and Numbers) Caught in 40 to 180 Fathoms by Hook-line and Pot Fishing in Virgin Islands Explorations, 1970-1971

Species	Scientific Name (s)	Total Lbs.	No. of Fish
Silk snapper	<i>Lutjanus vivanus</i>	2,352	846
Groupers (9 species)	<i>Epinephelus mystacinus</i> , <i>E. guttatus</i> , <i>E. striatus</i> , <i>E. adscensionis</i> , <i>E. flavolimbatus</i> , <i>Petromentopon cruentatum</i> , <i>Mycteroperca interstitialis</i> , <i>M. venenosa</i> , <i>Cephalopholis fulva</i>	1,014	69
Blackfin snapper	<i>Lutjanus buccanella</i>	595	246
Other snappers (7 species)	<i>Lutjanus jocu</i> , <i>L. analis</i> , <i>L. purpureus</i> , <i>Rhomboplites aurorubens</i> , <i>Pristipomoides macrophthalmus</i> , <i>Apsilus dentatus</i> , <i>Etelis oculatus</i>	377	195
Other species (5 genera)	<i>Caulolatilus</i> , <i>Seriola</i> , <i>Caranx</i> , <i>Malacanthus</i> , <i>Haemulon</i>	365	36

potential. At the same time, considerably larger boats with more sophisticated gear would tear up their nets (and the bottom) and would not make large-enough catches to justify the initial investment.

POT FISHING

Beyond the problems of ciguatera, rough seas, long distances to good fishing grounds, and bottoms generally not conducive to effective fishing, the fishermen must also contend with theft and vandalism of fish pots. Many pot fishermen have recently gone out of business because so much of their gear has been stolen, picked clean, or destroyed by thieves. The Virgin Islands government refuses to make any provisions to protect fishermen "in this regard."

The basic flat Antillean fish pot (of the "S", "Z", or "arrowhead" type) is still the most effective way to catch bottom fish around the Caribbean banks in one to 200 fathoms. For the best catches, they should be baited with fresh oily or bloody fish, and the funnel entrances improved to reduce escapement. Scuba studies of fish behavior in response to various types of pot sets in Jamaica (Munro, Reeson, and Gaut, 1971) and in the Virgin Islands (assisted by Lou Barr of NMFS Auke Bay, Alaska laboratory) show that traditional funnels allow a large percentage of fish to escape. Some nonreturn devices for pot apertures could be adapted. The effective pear-shaped funnel types with the inner edges turned down (some of the better fishermen build them) could be employed more widely (Brownell and Rainey, 1971). The problem of theft and vandalism could be greatly diminished with the use of "pop-ups" on buoy lines, or running pots in strings that could be grappled and lifted with a pot hauler.

CONCLUSIONS

Though the delightful Caribbean climate makes fishing in the Virgin Islands region a pleasant activity, the catch per-unit-effort is extremely low, especially in the long run. For fishermen to make a decent living, and local markets to offer an adequate supply of fresh fish, fishermen and government must make an organized effort to establish and carry out a program of fishery development.

If there is proper management, a small fleet of fast 22-25-ft. fiberglass displacement hull boats with mechanical haulers could increase catch and meet local demand without depleting the resource. A standardized boat-building program operated by trained fishermen and with government financing would be necessary. Basic fish handling, distribution, cold storage, and ice-making facilities are essential. Also needed are reasonably priced services to fishermen in boat repair, engine maintenance, and wholesale or duty-free supply of gear, equipment, and fuel.

Probably a 30 to 40 ft. lobster or shrimp-type boat requiring a relatively small investment--and with a hard working crew, efficient equipment, and plenty of range--could yield a decent living for two fishermen. This could not be done without better marketing, gear procurement, and repair arrangements.

Unfortunately Caribbean island governments have yet to realize that their economic, social, and aesthetic future depends upon well-planned management of the marine environment. There must soon occur a reversal of the trend toward sacrificing all human and natural resources for the sake of developing tourism. The short-term approach of severely altering coastal marine environments to construct resorts, and to channel all manpower into tourist services will result in the unbalanced and destructive use of certain resources. Eventually, fishermen and farmers would disappear. Government investment, fishermen effort, appropriate legislation, fisheries extension, and training programs could build a fishing industry in the islands that would provide economic diversity, better nutrition, a fresh fish boost to tourism, more jobs, and more efficient use of the limited but available fishery resources.

ACKNOWLEDGMENTS

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BAITFISH SCOUTING IN THE TRUST TERRITORY

Thomas S. Hida

The NMFS 'Townsend Cromwell' departed Honolulu for the western Pacific April 9, 1971. She stopped at numerous islands in the Marian, Palau, Caroline, and Marshall Islands before returning to Honolulu on July 8, 1971. One primary mission was to scout for concentrations of baitfish that would be used for live-bait, pole-and-line skipjack-tuna fishing, and purse-seining purposes. Large concentrations of sardines were found on Jaluit and Majuro in the Marshall Islands. Most islands to the west and south of Truk had no substantial amount of baitfish other than the round herring, which was found in fair-to-good quantities. However, Hawaiian skipjack-tuna fishermen have found these to be very weak baitfish which, they claim, live only a few hours in the baitwells.

The primary purpose of cruise 53 of the 'Townsend Cromwell' was to determine the availability and abundance of bait species suitable for surface pole-and-line skipjack-tuna fishing and for purse-seining operations in the Trust Territory of the Pacific Islands. This was the first of three cruises planned for this region.

The Japanese investigated the skipjack resources of Micronesia soon after taking over the islands from Germany at the beginning of World War I (Wilson, in press). They began fishing skipjack tuna commercially in Palau from 1925 and, by 1937, had built up a fairly large fishery that reached a peak of 33,000 metric tons. Most of the tuna were landed in Truk and Palau, others in Ponape and Saipan. It was estimated that about 40 skipjack fishing boats operated in Truk before World War II.

Presently, about a dozen Okinawan skipjack-tuna fishing vessels operate out of Koror, Palau. The Palauan skipjack fishery has developed gradually over the past several years. Catches have increased accordingly. It seems that more skipjack tuna can be harvested from Micronesia, and fishery researchers are looking for means to accomplish this.

Cruise 53 included stops at many islands (Fig.). By necessity, the surveys were brief and the two succeeding cruises may alter the conclusions presented here.

PROCEDURE

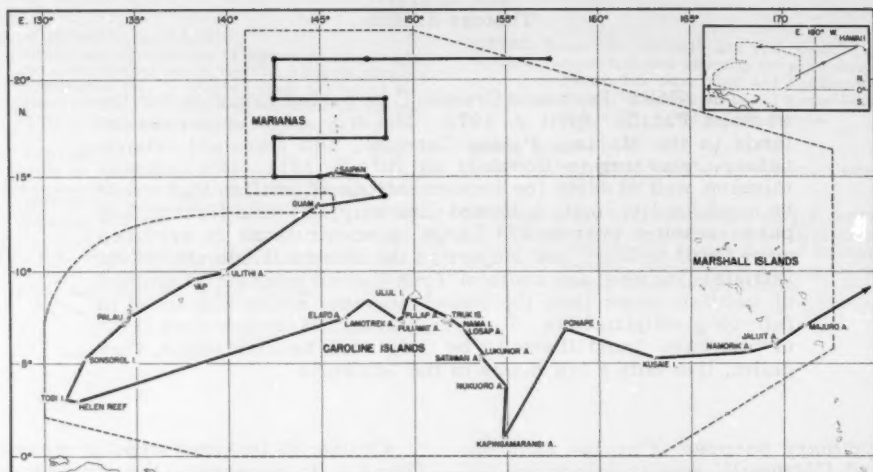
The surveys were conducted by walking and diving along the shoreline of the islands, scuba diving in the deeper waters, observing while cruising along on small skiffs, and by working night light stations. Two Boston whalers and a Hawaiian-type bait skiff with outboard motors, each with two or more observers, made the surveys. A 300-watt light bulb utilizing ship's power, and a 50- or 150-watt light bulb operated off a gasoline-powered portable generator, were used for night lights. The bulbs were submerged from a few feet to about a fathom. Samples of baitfish were caught by dip net, cast net, day seine, night net, night trap, and spear.

Courtesy calls were made on the chief or spokesman of nearly all of the islands where scouting stops were made. Permission was obtained before any bait survey or sampling was conducted. Most chiefs or spokesmen consented without hesitation. Peace Corps workers were very helpful in interpreting and,

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For itinerary and complete findings of baitfish survey, by islands, write for Reprint No. 925, NOAA Publications, AD 165, Bldg. 52, Connecticut Ave. & Van Ness St., NW., Washington, D.C. 20234.

COMMERCIAL FISHERIES REVIEW
Reprint No. 925



Track chart of 'Townsend Cromwell,' cruise 53, in the Trust Territory of the Pacific Islands.

at times, were instrumental in persuading chiefs to sanction our work. Most chiefs and elders were able to converse in Japanese, and many interviews were conducted in it.

RESULTS

The baitfish species found at nearly all atolls and islands were:

- | | |
|---------------|--|
| Goatfish | - mostly <u>Mulloidichthys samoensis</u> |
| Jack | - mostly <u>Caranx</u> spp. |
| Round herring | - <u>Spratelloides delicatulus</u> |
| Cardinalfish | - species of Apogonidae |
| Bananafish | - species of Caesionidae |
| Silverside | - species of Atherinidae |
| Damselfish | - species of Pomacentridae |

The round herring were most abundant in the lagoons of large atolls. They were seen while diving along coral outcroppings, or from skiffs when frightened by the approach of the skiffs, or when pursued by predators. Normally, they accumulated under night lights on dark nights. The juvenile goatfish and jacks were common but rarely found in large enough concentrations to be used as

baitfish. They could be seen by walking or diving along the shore, in the shallows or, at times, along the lagoon drop-off.

The cardinalfish could be found at times concentrated in large coral heads. They were also seen scattered along shallow reefs around coral rubble, but so sparsely that it would be impractical to catch them in quantities sufficient for use as baitfish. The bananafish were usually found over coral outcroppings close to the lagoon drop-off. Some schools were estimated to consist of about 10 buckets (a bucket equals 8 pounds). The silverside were usually found close to the shoreline in shallow water. In mangrove areas, they were spread lightly throughout most of the root area, which made them very difficult to catch. The damselfish were usually spread out over coral heads, over coral rubble, in the shallows, and along the lagoon drop-off.

In addition to the baitfish found in the atolls to the west and south of Truk, a few others were found to the eastward:

- | | |
|---------------|---|
| Anchovy | - <u>Stolephorus heterolobus</u> and <u>S. indicus</u> |
| Damselfish | - species of Pomacentridae |
| Round herring | - <u>Spratelloides delicatulus</u> |
| Sardine | - <u>Herklotsichthys</u> sp. and possibly <u>Sardinella</u> sp. |
| Silverside | - species of Atherinidae |

The sardines were found in the largest concentrations on Jaluit and Majuro atolls, in shallow areas of less than 3 fathoms. The silverside were also quite abundant in the shallows. Anchovies were found in the deeper parts of the harbor and entrance to Ponape, and also in Kusaie Harbor. Quite a few schools of anchovy were seen in Ponape. But, due to harbor depth (about 40 ft), our 21-ft seine was unable to catch them for estimates of abundance. The damselfish were scattered throughout the lagoon drop-off over coral heads. The round herring were abundant over coral outcroppings and widespread in lagoon areas.

OBSERVATIONS ON TUNA SCHOOLS

There were 122 schools sighted during the cruise. Of these, 92 were unidentified, 21 were skipjack tuna, 5 were yellowfin tuna, 2 were porpoise (*Delphinus* (?)), 1 was common dolphin (*Coryphaena hippurus*), and 1 was a mixed school of skipjack and yellowfin tunas. For the area covered during this cruise, the number of schools seen was considered poor. An increase in sightings occurred just to the north and east of Wake, at about lat 21° N. Flocks of migrating shearwaters (*Procelariidae*) were also seen for a few days while crossing this area. Another increase was noted in the vicinity of Helen Reef and to the northeast at about lat 4° N. Even in these two areas, where a relatively good number of schools was sighted, the prospect for pole and line or purse seining was not favorable. This lack of good fish signs was evident throughout the cruise. The time of the sur-

vey was not the season for tuna school abundance in this area (Tohoku Regional Fisheries Research Laboratory, undated).

CONCLUSIONS

The best concentration of baitfish was in the Marshall Islands. A school of sardine estimated to exceed 25 tons was seen at Jaluit; thousands of buckets more of sardine, silverside, and a few other baitfish were seen along the shoreline of the fringing islands. Thousands of buckets of sardine, silverside, and a few other baitfish were also seen along the shoreline on Majuro atoll. Interviews with several people on Majuro also revealed that other atolls in the Marshall Islands carry heavy concentrations of sardine.

Ponape was the only island where a good number of anchovy (*Stolephorus heterolobus*) schools was seen. They were mostly in the harbor and along the channel but could not be caught with the shallow day seine. The anchovy were in the deeper part of the harbor, where a deep lampara net is needed to catch them. Night lights attracted only a few buckets of them, but this method should be more productive under the right conditions. This same species is caught exclusively by night net in the Palau Islands. Kusaie had a few anchovy, but a good assessment was not obtained because of turbid conditions and time limitations.

I thank the crew, scientific staff, and observers who helped make this cruise possible.

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INPFC MEETS IN ALASKA

The 18th annual meeting of the International North Pacific Fisheries Commission (INPFC), which concluded in Anchorage, Alaska, Nov. 5, 1971, reviewed the results of conservation programs and scientific research on North Pacific fishery resources. INPFC members represent Canada, Japan, and the U.S. Elmer E. Rasmuson of Anchorage was chairman.

About 80 administrators, scientists, industry advisers, and consultants from the International Pacific Halibut Commission participated. The discussions dealt primarily with ensuring the continued orderly development of fisheries resources to maintain maximum sustainable yields.

In fisheries characterized as fully exploited and under an effective program of research and management for conservation, the Convention bars members that have not participated in these fisheries. No changes in the abstention provisions were recommended.

Commission Recommendations

The Commission recommended that contracting parties consider the conservation needs of salmon stocks in areas of intermingling when preparing fishing regulations.

In fisheries exploited by two or more member countries--king crab and tanner crab of eastern Bering Sea, and groundfish other than halibut in Northeast Pacific Ocean--scientific studies will continue.

Halibut Fishing Recommendations

The Commission recommended conservation measures for halibut fishing in the eastern Bering Sea in 1972. Such recommendations have been made annually since 1963, when line fishing for halibut first opened to all three nations. The Commission's 1972 recommendations are similar to 1971's: the open season in certain fishing grounds of eastern Bering Sea is modified. Also, an extensive area in the southeastern Bering Sea, a nursery ground for young halibut, again is recommended for complete closure.

The Commission again urged members to obtain data on the interrelationships between the condition of halibut stocks and the trawl fisheries for other species.

Commission Members

Commission members are: for Canada--C.R. Levelton, James C. Cameron, Carl E. Giske, and Donovan. F. Miller; for Japan--Kenjiro Nishimura, Masatada Tachibana, Toshihiko Ohba, and Haruo Nakai; for the U.S.--Milton E. Brooding, Edward W. Allen, Elmer E. Rasmuson, and Philip M. Roedel.

The 1972 meeting will be held in Vancouver, Canada, beginning Oct. 30. Officers elected for 1972 are: C. R. Levelton, Canada, chairman; Kenjiro Nishimura, Japan, vice-chairman; Elmer E. Rasmuson, U.S., secretary.



SOUTHEAST ATLANTIC FISHERY CONVENTION IS IN EFFECT

A convention to conserve the living resources of the Southeast Atlantic Ocean came into force on Oct. 24, 1971, after the Soviet Union had ratified it, reports FAO.

South Africa, Japan, and Portugal already had ratified it. The convention was to become effective when accepted formally by at least 4 nations with a total 1968 catch in the Southeast Atlantic of at least 700,000 metric tons. The USSR, South Africa, Japan, and Portugal caught more than 2.9 million tons of fish there in 1968.

The 21-article treaty, drafted under FAO auspices, was adopted at a conference at FAO, Rome, October 1969. All participants at the conference, or members of U.N. or its specialized agencies, may subscribe to the convention. It is titled: The Convention on the Conservation of the Living Resources of the Southeast Atlantic.

The Convention

The Convention seeks to regulate fishing of heavily exploited stocks off Africa

between 6° south and 50° south latitude, and 20° west and 40° east longitude. It provides for establishment of International Commission for the Southeast Atlantic Fisheries. The Commission will study and recommend rational exploitation of the fisheries. It will be aided by a scientific advisory council and by subsidiary committees. Although independent of FAO, it will cooperate closely.

Catch Increased 30 Times

Fishing in the Southeast Atlantic has increased 30 times in 30 years: from under 100,000 metric tons a year before 1939 to 3,300,000 tons in 1968. Hake and pilchard were the main fish catches.

Nations that have signed but not ratified the convention are: Belgium, Cuba, West Germany, Italy, and Spain.



NORWAY FINANCES AND BUILDS FAO RESEARCH VESSEL

Norway is building a \$1.3-million fishery research vessel for FAO's exclusive use, reports FAO. The ship will be the largest and best equipped of FAO's fleet of more than 100 fishery vessels. Their work is financed mainly by the United Nations Development Program (UNDP). The new vessel will speed existing projects and conduct exploratory surveys and training.

FAO assists over 50 projects in almost 70 developing countries and territories.

Norway's Institute of Marine Research will operate it for FAO. Completion is scheduled for late 1973. Operating costs of the Norwegian-registered ship will be shared.

The Vessel

The vessel will be a Norwegian-type combination trawler about 151 feet by 33 feet: 1500 HP engine, estimated speed of 13.5 knots, equipped with electronic gear for exploratory fishing, and laboratory for biological and oceanographic research, crew of 13, accommodations for 7 FAO scientists and technologists, and 8 counterpart crew or trainees from developing countries.

When completed, the vessel will undergo a 6-month trial cruise along Africa's western coast.

ICELAND SEEKS TO EXTEND FISHERY LIMITS TO 50 MILES

Iceland has asked Great Britain and West Germany to renegotiate their 1961 fishery agreements that established Iceland's exclusive 12-mile fishing limit. Iceland now intends to extend its limit to 50 miles by September 1972. It contends that international arrangements to conserve fish stocks off its coast are not doing the job. Instead of reducing fishing effort, other nations are increasing their fishing with larger, more efficient vessels. Iceland says it is necessary to take immediate measures to regulate the fisheries.

1961 Agreement

The 1961 agreement followed the "cod war" of 1959 and 1960, when Iceland decided to extend its jurisdiction from 4 to 12 miles. Britain did not recognize Iceland's extension to 12 miles until a compromise was reached in 1961. This allowed Great Britain to fish in defined areas between 4 and 12 miles for 3 years. A similar agreement was concluded with West Germany.

Iceland Unwilling To Wait

Britain has asked Iceland to postpone action until the 1973 Law of the Sea Conference. Both Britain and West Germany have asserted that Iceland's extension of the 12-mile limit would be contrary to international law and violate the 1961 bilateral agreements. However, Iceland is unwilling to postpone the issue until 1973. It claims that the 1961 agreements are unacceptable in the light of fishery and economic developments in the last 10 years. It does not believe that the UN or the International Court would approve fishing-limit expansion in time to save the fish stocks.

The 3 governments are discussing the matter. (U.S. Embassy, Reykjavik)



WHALE DOOMED, ECOLOGISTS SAY, BUT INDUSTRY SEES FEAR AS MYTH

James P. Sterba

TOKYO--The 518 crewmen of 'Kyokuyo Maru No. 3', one of the world's largest whaling factory ships, were led in a banzai cheer. Then, as the ship--as long as two football fields--was tugged from its berth at Chiba, on Tokyo Bay, colored streamers stretched between the crewmen and their families, whom they would not see for the six months they will spend in the Antarctic.

Despite the cheers and the streamers, this modern whaling expedition would have none of the romance about which Herman Melville wrote. Whale herds would be located by scout ships and sonar, frightened by high-pitched sounds and chased to near-exhaustion. An explosive charge would be embedded deep in a whale's body, after which the carcass would be towed to a factory ship, to be sliced into parts within an hour.

In Captain Ahab's day a whaling boat averaged a whale a month; today, it is estimated, a whale is killed every 12 minutes by the worldwide industry. American conservationists maintain that the whales are threatened with extinction.

The conservationists, deploring the commercial killing, persuaded the United States Government last December to forbid imports of whale products and, in March 1971, to eliminate American whaling. They are now seeking a worldwide moratorium.

Whale Meat for Food

But the Soviet Union and Japan, which together killed 84 percent of the more than 42,000 whales reported taken last year, accept neither the argument nor the moratorium idea. Both countries use whale meat for food, and whale products go into such diverse items as transmission fluid, lipstick, fertilizer and animal feed--for all of which there are adequate substitute sources.

Officials in Tokyo maintain that whale meat is an essential of the Japanese diet, accounting for 10 percent of the animal-protein intake in 1969. Soviet spokesmen say populations in underdeveloped Siberia and the Asian regions rely on whale meat as a cheap source of protein even though it is mostly used for dog and cat food around Moscow.

Nearly everyone concerned with whaling agrees that several species of the giant sea mammals--the largest of which outweigh prehistoric dinosaurs--have been reduced to remnants.

According to whaling records, modern whalers with harpoon guns mounted on fast killer boats have taken more whales in the last 48 years than were killed in the previous four centuries by their brethren with hand harpoons.

It is another example, conservationists assert, of man's wasteful management of a

Reprinted from The New York Times, Nov. 30, 1971.

valuable natural resource. Kept to "maximum sustainable yield"--at which the birth-rate determines the number killed--whales could have provided food for millions of people indefinitely.

Oceanic Disruption Feared

Some scientists fear that the decline in whales will cause ecological disruption of the oceans. Others believe that whaling should cease because the sea mammals--the whale and the porpoise--have intelligence closest to that of man and should be carefully studied.

Of the eight largest species, the right and bowhead whales--targets in the 18th and 19th centuries because they were slow and floated when killed--are virtually extinct. Blue, humpback and gray whales have been reduced from hundreds of thousands to a few thousand in 40 years and they are nominally protected by whaling nations.

Stocks of three other species--finback, sei and sperm--have been reduced by more than half, but they continue to be hunted under international sanction despite the contention that they are destined to share the fate of the others. Many whalers and officials in Japan describe that view as emotional nonsense.

International efforts to preserve whale herds at levels of maximum sustainable yield were late in coming and have been largely unsuccessful. The International Whaling Commission, established by 17 nations in 1946 with no enforcement powers, began setting yearly kill quotas, for all except the sperm whale in 1949.

Quotas for sperm whales in the North Pacific were established in 1970, but limitless killing is allowed everywhere else.

Quotas have dropped sharply since 1949 in the Antarctic, which has been the world's major whaling ground since Norwegians discovered extensive herds there in 1904. Conservationists say the decrease shows that the quotas have consistently been set too high by delegates representing whaling concerns.

One of Japan's two delegates is Iwao Fujita, a former commission chairman who is also president of the Japan Fisheries Association, which lobbies on behalf of fishing companies.

Dr. Douglas G. Chapman, chairman of the commission's scientific committee, said in recent United States Congressional testimony: "During its early years the commission took a number of restrictive acts, but unfortunately, in general, the restrictions were too little too late and were often rendered ineffective by individual vetoes."

The 10-year moratorium proposed by the United States would undercut the commission at a time when it is just beginning to be effective, he added.

Observer Failed To Appear

The issue of control reaches down to the individual whaler. Below decks on *Kyokuyo Maru*, amid boilers for turning blubber into oil and refrigeration compartments for storing meat, there was a strong aroma of dead whales taken weeks before. Two decks below the bridge Capt. K. Yanagisawa had readied an officer's cabin for an international observer, who was to make sure that protected whales were not killed and quotas not exceeded and that seasons were observed. He did not show up.

An international observer plan was proposed by Norway in 1955 but has been put off

since. In late September Japan, the Soviet Union and Norway--each suspecting the other of violations--initiated an Antarctic observer agreement. Japan and the Soviet Union, with three factory ships and about 40 killer boats each, and Norway, with one small combination killer-factory ship, reported killing 11,770 whales in the Antarctic last year.

Before the agreement could be ratified and observers could get aboard, the Soviet fleets sailed, so the Japanese fleets will not have international observers either. Officials said the Soviet fleets could have easily waited a few more days since the season does not open until Dec. 5.

The empty cabin on Kyokuyo Maru will be occupied by the best-paid man aboard--the chief harpoon gunner. His men, on nine fast 750 ton killer boats, aim and fire the 150-pound harpoons.

A Big Breakthrough Seen

Another international observer agreement was signed last month for the North Pacific season, which begins next spring, but it still needs governmental ratification. Conservationists say it will represent a major breakthrough--if it goes into effect.

All the controls have their limits. There are 22 coastal whaling stations around the world not bound by the international commission's rules and quotas, although some countries have their own. From those stations killer boats go out for short periods and tow

back catches for processing on shore. Their take last year is listed as 11,719 whales.

The most frenetic whaling took place in the thirties and from the end of World War II until the middle sixties. In 1961, 21 factory ships, each with roughly a dozen killer boats, scoured the Antarctic, killing 37,350 whales. But as the herds dwindled the major whaling nations that were out for oil lost money and cut back or dropped out.

Although Japan and the Soviet Union have scrapped a total of five fleets since 1969, they have survived because they use whale meat, the price of which has been rising, for human consumption. The others, more wasteful, boiled the meat for its small quantities of oil--most oil comes from blubber--or used it for animal feed and fertilizer.

Big Yield in Edible Meat

In Japan the average baleen whale yields 74 percent edible meat, 24 percent oil and 2 percent other nonedible products. Roughly two-thirds of a sperm whale is turned into oil, which is valuable to industry; the other third is a dark, strong-smelling meat that is unpopular here, so large amounts go to the United States as food for mink farms.

Whaling in Japan is an \$80-million-a-year business divided among three of the world's largest fishing concerns--Taiyo Fishery Co., Ltd.; Nippon Suisan Co., Ltd., and Kyokuyo Co., Ltd. Diversified companies, their combined sales were about \$1.3 billion in 1970.



PORTUGAL'S COD CATCH IN ICNAF AREA IS LOW

In 1970, Portugal caught 163,000 metric tons, mainly cod, in the ICNAF area (Int'l Convention for the Northwest Atlantic Fisheries), lowest in many years. In 1967, the catch was 237,000 tons; it has declined each year since then.

In 1970, 36 trawlers participated in this fishery, 3 more than in 1968. To secure full cargoes, trawlers had to extend fishing season to make up for scarcity of fish. Only 24 line fishing vessels took part, compared to 30 in previous years. Three liners ceased operation in 1970; 4 others were converted to trawlers, which delayed somewhat their departure for fishing grounds.

Can't Meet Home Demand

Portuguese officials contend that the fishing zone limitations imposed by Canada and Greenland are forcing replacement of most cod line-fishing vessels by modern stern trawlers equipped with freezing and salting facilities. Their cod production, stable for many years, has not been sufficient

to supply domestic requirements. Considerable quantities have to be imported. The trend to modern freezing and frozen food distribution is expected to increase requirements for frozen fish products.

6-Year Program

In 1968, Portugal began a 6-year program to renew and modernize its high-seas fishing fleet. It provided for investment of US\$65 million during 1968-73. This is directed mainly to increase production in distant-water fishing, improve quality of product, and expand markets. Of the \$65 million, the largest portion, \$36 million, is to increase trawler fishing off Africa. About \$14 million is for cod fishing. Also in the program are plans to build 3 stern trawlers, one cod longliner, 4 pair trawlers, and conversion of some line fishing vessels to trawlers and freezers. Late in 1969, two new stern trawlers were added. Government investment in cod fishing in 1969 was reported to be \$2.5 million and, in 1970, about \$1.4 million.

DENMARK IMPOSES 10% IMPORT SURCHARGE ON PROCESSED FISH

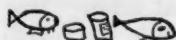
Effective Oct. 20, 1971, Denmark imposed a 10% import surcharge on all prepared and preserved fish products covered by Chapter 16 of Brussels Tariff Nomenclature (BTN). Products in BTN chapter 03 (fresh, chilled, frozen, dried, smoked, and salted products) and fish oil are not subject to the surcharge.

U.S. Products Affected

In 1970, Denmark imported from the U.S. fishery products worth \$790,000 under the

affected tariff categories. Frozen cooked shrimp is principal product in this trade. Canned shrimp, canned oyster, and canned salmon are also affected.

The 10% surcharge is to be reduced to 7% on July 1, 1972, and to 4% on Jan. 1, 1973. The surcharge will end March 31, 1973. (U.S. Embassy Copenhagen, Oct. 22, 1971.)



SOVIET YOUTH REJECT SEA AND PIER JOBS

Although the Soviet government has ambitious plans to expand the merchant fleet and the ports, the sea is no longer attracting enough young men to match these plans. This was reported by Hedrick Smith to The New York Times Nov. 1, 1971.

Mikhail A. Kalin, director of Odessa port, said: "For some time we have needed 200 more workers on our docks and in spite of notices and announcements in newspapers around the country, we cannot get these men."

At Odessa, and its sister city Ilyichevsk, 22 miles south on the Black Sea, recruiting and retaining enough workers have been continuing problems. Officials at Ilyichevsk reported that the port admits about 1,500 new men into its basic 2-3-month training course every year--and that 40% leave when the course ends. Others drift away in the following months; some stay to work at the fast-growing port.

Job Not Glamorous Enough

In the age of space flights, jets, computers, and electronic equipment, some port officials suggest, being a dockworker or a merchant seaman holds too little glamor. Other officials say this problem affects other sectors too: restaurants, hotels, service industries generally, and nearly all food or general merchandising stores.

The editor of the 'Odessa Port Gazette' states: "Nowadays, the young want push-button jobs."

Labor Shortage A National Problem

The labor shortage in ports and merchant fleets is a general problem of the Soviet economy. This was emphasized in April 1971 by Leonid I. Brezhnev, party leader, and Premier Aleksei V. Kosygin in speeches to the Communist party congress.

Said Brezhnev: "In the years 1971-75 the possibilities of attracting additional labor forces are diminished compared with the preceding 5-year period." He was referring to the near-completion of campaigns to attract more women, older persons, and even

youngsters into the job force. Foreign specialists say that Moscow has nearly exhausted these reserves.

Soviet Plans

Despite this problem, Soviet leaders projected an annual growth rate through 1975 of nearly 7%--while the work force would be increasing a little over 1% a year. They emphasized increasing productivity primarily through mechanization and modernization.

Both Odessa and Ilyichevsk ports are using this approach, but officials are worried about their chances to attract young workers. M. A. Kalin said: "Young people don't want to work here as they did before. They have become too educated. They want to work on planes, computers, machines. They don't consider this very high-level work. Even the pay, the housing we provide and other services do not attract them."

The Pay

Valentin I. Zologaryev, Ilyichevsk port director, reported that an inexperienced dockworker starts at 170 rubles (\$187, officially) a month. He can work up to top-skilled job in highly graded dock-workers' brigade at 350 rubles (\$385). Western specialists estimate this pay to be about equal to average Soviet monthly wage.

August D. Kuznetsov, a deputy director of Odessa port, noted that youthful impatience to advance troubles the merchant fleet. "We have a very young maritime fleet--most ships are only 8 to 10 years old. We have enough officers but not enough ordinary sailors."

Workers Support Automation

M. A. Kalin pointed to one benefit of the labor shortage on the docks: unlike many western dock-workers, the Soviet support automation in handling cargoes and the trend toward containerized ships. He explained that the more mechanized jobs merit higher pay. Because there is a relatively short supply of labor, workers can expect to be upgraded and to receive more money as the ports are mechanized.

MEXICO REVEALS 5-YEAR FISHING-VESSEL BUILDING PLANS

During the next 5 years, Mexico plans to build these fishing vessels:

- 500 shrimp boats, 67 to 72 feet long
- 300 hand-line boats, 36-50 feet
- 100 all-purpose finfish boats, 60-65 feet
- 70 sardine purse-seiners, 86 feet
- 30 tuna purse-seiners, capacity 350 to 500 tons.

The shrimp fleet has 1404 vessels: 762 on Pacific coast, 642 on Gulf coast; 780 are

over 15 years old. Plans call for replacing each group of 14 old vessels with 10 new ones.

Construction of the other vessels is designed to further diversify the fishing industry and to increase fish production.

If carried out, this program will require considerable machinery and equipment not manufactured in Mexico. Most, if not all, construction will be done in Mexican shipyards. Plans for financing were not revealed. (Reg. Fish. Att., U.S. Embassy, Mexico, Nov. 1, 1971.)



FISH CATCH RISES 9% IN FIRST-HALF 1971

During the first 6 months of 1971, Mexico's fish production gained 9.1% over first-half 1970; the total was 133,308 metric tons. Among edible species, sardines soared 55.7%, grouper 33.3%; anchovies dropped 80%, shrimp 9.5%. Shrimp production during second half will be considerably better; there probably will be net increase for 1971 over 1970.

Industrial Products Up 18%

Industrial products increased 18.1% over 1970 period. Fish-meal production at 11,786

tons was up 19.4% from 1970. Mexico is moving steadily toward self-sufficiency in this product.

Exports Down 5%

Exports of shrimp, by far the most important seafood export, fell 5% from 1970 period. Total value was US\$21.7 million. Most went to the U.S. This was expected to improve in second half of 1971.



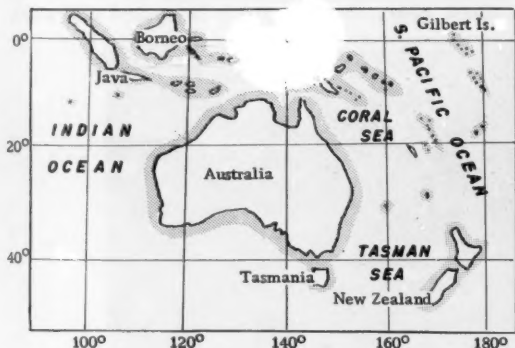


Guam fisherman casts his net. (Photo: U.S. Navy)

AUSTRALIA's FISHERY EXPORTS SET RECORD

Australian exports of frozen rock lobster tails, shrimp, scallops, canned abalone, and cultured pearls set records in the year ending June 30, 1971. The main markets were the U.S. (53% by value) and Japan (30%). These data were reported in 'Australian Fisheries', Sept. 1971.

Exports of frozen rock lobster tails totaled 10 million pounds worth US\$34 million. This was a rise of 17% in quantity and 41% in value from previous year. Exports of frozen whole rock lobster dropped 52% to 587,000 pounds worth US\$934,000. This was due mainly to high prices for tails. The U.S. took practically all of the tails and France 68% of frozen whole lobsters.



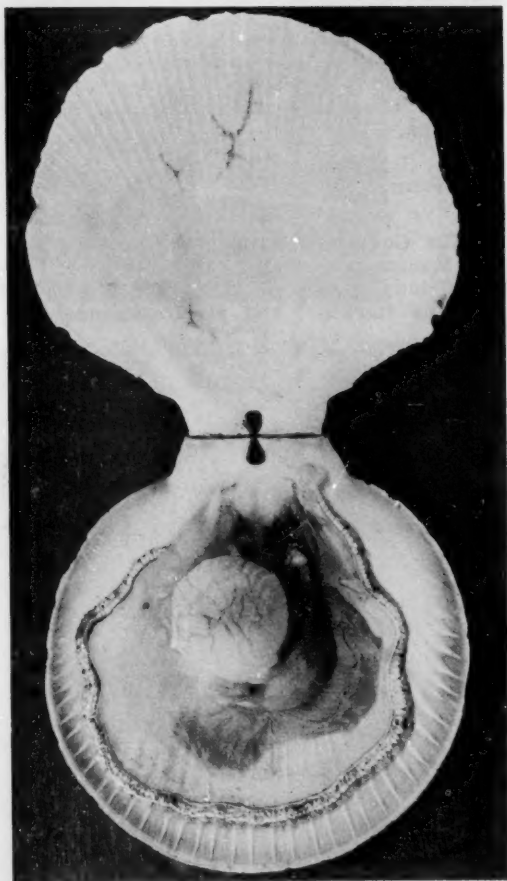
Shrimp Up 40%

Shrimp exports of 14.9 million pounds worth US\$21.2 million were up almost 40% from previous year. Japan took 78%, the U.S. 10%.

Exports of canned abalone rose 41% to almost 5 million pounds; frozen abalone was

4% higher--2.3 million pounds. Hong Kong took 45% of canned abalone, Japan 59% of frozen abalone.

Exports of scallops rose about 90% to 2.2 million pounds worth US\$2.7 million. France took 61%, the U.S. 29%.



A Queensland scallop in its shell showing the large adductor muscle or meat. (Photo: Australian News & Info. Bur.)

NEW ZEALAND'S ROCK-OYSTER FARMING MAY BECOME EXPORT INDUSTRY

New Zealand has been trying to broaden the base of its fishing industry. Most progress has been made with rock oysters. Rock-oyster farming, introduced only 6 years ago, now is approaching the point when it will become an export industry.

The Rock Oyster Farming Act was passed in 1964. Before that, the New Zealand Marine Department was responsible for protecting, harvesting, and marketing rock oysters from natural beds. Now orderly rows of wooden stands stretching from the shoreline of harbors and estuaries in northern North Island mark the sites of private rock-oyster farms. Leases have been granted to 133 private farmers.

Government Aid

The Government too is in the business. The Marine Department has established four 1,000-tray farms in the Bay of Islands, in Kaipara Harbour, and at Coromandel. Its

farms produce commercially. However, they were set up primarily to help private farmer as experimental and demonstration farms. They were the first step in creating the industry.

Government activities include research and experiments to establish data and procedures. Farmers agree that these have been a major factor in the industry's status today.

Rock-Oyster Farming

Rock-oyster farming demands steady, regular work. On Government farms, it is 43-hour week, sometimes odd hours if work must start about 3 a.m., and sometimes muddy work. A workshop and punt are among necessary installations.

The young oysters are raised in one area and transferred to others to grow. In the third year, the fat stock is culled and sold;

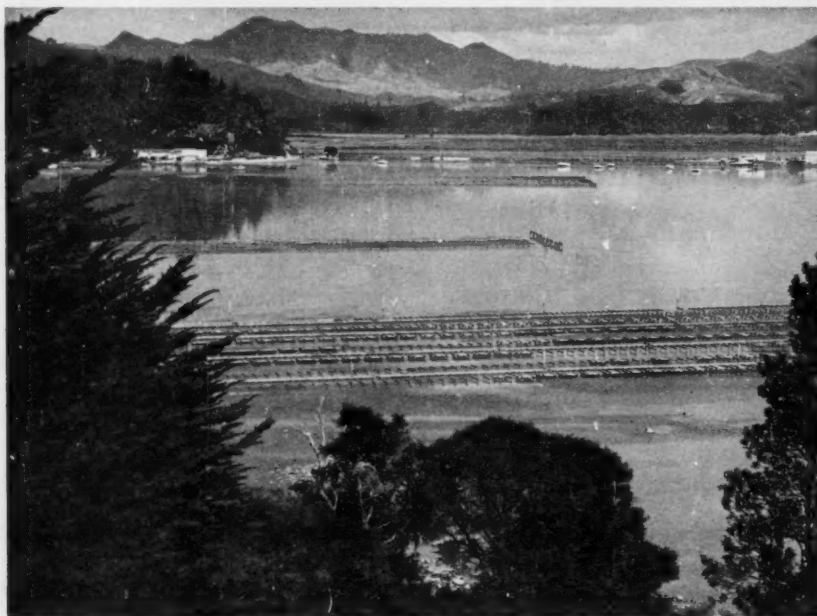


Fig. 1 - Rock oyster farms at Coromandel, New Zealand. The Marine Department's farm is in background; two private farms in foreground.



Fig. 2 - At Marine Department's Coromandel farm, a punt is necessary transport to oyster racks.



Fig. 3 - A Marine Department rock-oyster spat-catching installation at Te Kapa Bay, Mahurangi Harbour. About 50,000 spat-catching sticks are in the photograph. The racks are covered from mid to high tide.

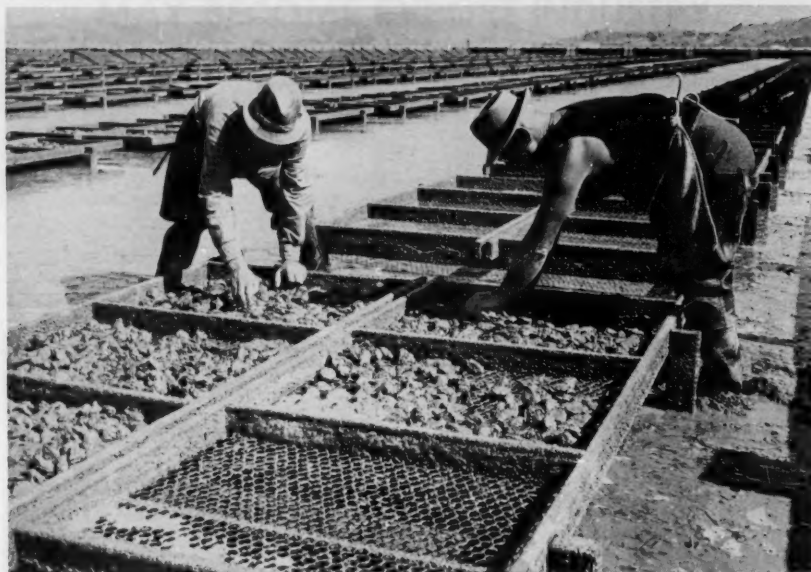


Fig. 4 - Racks of trays at Marine Department's Coromandel farm.
(New Zealand Information Service)

store stock is sent back to a fattening area until it can be sold.

There is no particular limit to oyster-farm size. Five acres could be an economic proposition for one man, but $7\frac{1}{2}$ acres would be more realistic. Some companies have planned 200-acre farms.

For many farmers, the industry is still part-time work. They are waiting to see their new venture full developed. Some are dairy farmers, one a dentist, a hairdresser, and a tobacconist who travels 70 miles to his Coromandel farm.

Potential Not Yet Realized

The full potential of rock-oyster farming has not been realized. Real production from private farms began in 1969. So far, it has been based on fattening natural rock oysters on trays. When this method changes to growing young oysters, or spat, off planted sticks,

there will be much more development. This will begin in 1972-73, when oysters on 100,000 catching sticks distributed to farmers in 1969 reach maturity.

1970 Production

In 1970, production from private farms rose 25%. It was worth NZ\$67,200 locally; in export revenue from Australia and Pacific Islands, NZ\$88,500.

Government farms added to the production success. In 1969, domestic sales were worth NZ\$25,300; from exports to Sydney, Melbourne, and Hong Kong, NZ\$21,600. In 1970, Government production was lower because of a policy of conserving supplies and spreading sales over a longer period.

The target for total sales of rock oysters by 1978 is NZ\$1 million. Progress to date suggests that this new farming industry could become a multimillion-dollar export earner.

JAPAN

U.S. CONTINUES TO DETAIN CANNED TUNA

Japanese canned tuna-in-brine shipments to the U.S. continue to be detained at ports of entry for failure to comply with U.S. Food and Drug Administration (FDA) quality standards. Since January 1971, 450,000 cases have been seized; the number is expected to exceed 500,000 cases by the end of 1971.

Reasons for Seizure

The FDA seizures stem primarily from the smell of off-odor in the pack, but honeycomb, off-color, and excess mercury also are reasons. The Japanese believe that rejections based on smell is due to the wide difference between Japan and the U.S. in judging fish smell--present in tuna packed in brine but disappears almost completely in tuna packed in oil. ('Suisan Tsushin', Nov. 2, 1971.)

COMPETITION DEPRESSES CANNED-TUNA PRICES

Canned tuna-in-oil sales on the Japanese market are rising yearly. The 1971 volume is expected to reach around 800,000 cases. The product is attracting attention because its market potential in Japan is very good. However, severe sales competition in recent months has reduced price sharply.

Large Drop

A major brand of canned albacore, previously retailed at 180 yen (US\$0.50) a can (7-oz.), now is selling for 130 yen (\$0.36) at some supermarkets. There is fear that price cutting might reduce quality and ruin a growing market.

This unfavorable situation was created by 2 factors: an oversupply that resulted from tuna packers cutting export production because of decomposition and mercury problems, and because packers increased output for domestic market. ('Suisan Tsushin', Oct. 30, 1971.)

TUNA FLEET OFF NEW YORK GROWS

Japanese tuna longliners off New York numbered 70 at the end of October 1971. They were concentrating on bluefin and bigeye tuna as alternate resources for diminishing southern bluefin off Australia and in Indian Ocean. In the latter, sharply declined hook rates have necessitated voluntary regulation by the Japanese.

Similar To Japanese Waters

The waters off New York, where the warm Gulf Stream encounters the cold Labrador Current, are similar to Japan's northeastern coast, where the Kuroshio and Oyashio currents meet to form good fishing grounds. The Japanese have known about the good bluefin grounds off New York since about 1963, but rough seas kept them away. But from around 1970, their longliners seeking high-value fish began fishing there. They found the catch and value good from September until around November; after that, the fish began migrating northeastward toward Newfoundland. ('Suisancho Nippo', Oct. 30, 1971.)

TRAWLERS TAKE HERRING IN ICNAF AREA OF NORTHWESTERN ATLANTIC

Four Nihon Suisan 2,500-gross-ton stern trawlers were operating in late October in the northwestern Atlantic Ocean regulated by the International Commission for the Northwest Atlantic Fisheries (ICNAF). From September 17-18 until about October 17, those vessels fished herring north of Georges Bank southwest of Nova Scotia and caught about 2,500 metric tons of egg-bearing herring. Many foreign vessels fished the herring grounds off Georges Bank and dispersed when the season ended around October 17.

Nihon Suisan's trawlers plan to fish squid in ICNAF area and off New York from December 1971 for about 2-3 months. Meanwhile, they will be scouting for good fishing grounds. ('Suisan Tsushin', Oct. 23, 1971.)

JAPAN (Contd.):

INTERESTED IN SEA-URCHIN
RESOURCES OF PERU AND CHILE

There is steadily growing demand for processed urchin roe in Japan. To meet it, sea-urchin-ro processors are turning to the urchin resources of Peru and Chile. These resources have lower harvesting costs than those of South Korea. The latter, a major urchin roe supplier, provides 80% of Japanese annual imports of about 1,000 metric tons.

Rising Cost of Korean Product

The South Korean product is high quality. However, the increasing cost of raw-material imports from Korea, where labor costs are rising sharply, is becoming a big problem for Japanese urchin-ro processors. ('Minato Shimbun', Oct. 3, 1971.)

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PURSE-SEINE FLEET IS CATCHING MANY
SKIPJACK OFF WEST AFRICA

The Nichiro Fishing Co.'s purse-seine fleet was making good catches of skipjack off Ghana in late October 1971. It was led by the mothership 'Hiroshima Maru' (3,600 gross tons, carrying capacity 2,500 tons).

Landings by the fleet's three pair-boat seiners to mid-October reached 3,000 metric tons of tuna, mostly skipjack mixed with yellowfin. This fleet began fishing in June 1971. Its catch target: 5,700 tons of skipjack and yellowfin. ('Katsuo-maguro Tsushin', Oct. 25, 1971.)

* * *

GOOD SQUID FISHING
OFF BAJA CALIFORNIA

The 'Ryoun Maru No. 3' (299 gross tons) was chartered by Japan's Marine Fisheries Resources Development Center for exploratory squid fishing off California in 1971. She departed Japan in August. On October 23, she landed 12 tons in one night off southern tip of Baja California (23° N. latitude and 112° W. longitude). It was the first time the vessel had made such a large catch on its present trip. The discovery of good fishing is likely to attract more squid vessels.

The Center was elated over the sudden improvement in fishing; 10 days earlier, it had appeared hopeless. Congratulations were cabled to the vessel.

The squid resemble the 'surume-ika' species off Japan. They average 700 grams (1.5 pounds) each.

The Vessel

Ryoun Maru is equipped with 20 mechanical and 10 manual squid-fishing gear. The survey will continue until December 20. Return to Japan is scheduled for Jan. 13, 1972. ('Minato Shimbun', Oct. 26; U.S. Embassy, Tokyo translation of 'Shin Suisan Shimbun Sokuho', Oct. 27.)

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SAURY FISHING OFF U.S. WEST COAST
CONTINUES POOR

Japanese saury fishing off the U.S. West Coast continues spotty. Twelve vessels (including motherships) were fishing in late October 1971 with 'boke-ami' (stick-held dip nets) and floating-type seine nets. Rough seas and scattered fish were making fishing difficult. The saury were small and lean. (Japanese prefer saury with high oil content.)

The Catch

One mothership fleet of Hoko Suisan, fishing for 55 days with two vessels, caught 392 tons (as of October 25), or about 50% of its 750-ton target. The saury vessels were expected to remain there 2-3 weeks more. ('Suisancho Nippo', Oct. 27, 1971.)

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SAURY LANDINGS
CONTINUE GOOD IN JAPAN

As of Oct. 20, 1971, saury landings in Japan were 141,458 metric tons worth 9,787.5 million yen (US\$27.2 million), reports the National Association of Saury Fishery. These landings are almost double the comparable 1970 figure of 75,060 tons.

At this rate, 1971 production is expected to reach 160,000 tons. The fish are small, so the average exvessel prices continue low--around 69.1 yen a kilogram (\$174 a short ton). A year earlier, price was 114.7 yen a kilogram (\$289 a short ton). ('Minato Shimbun', Oct. 31, 1971.)

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JAPAN (Contd.):

BAIT SAURY CATCH IS BELOW
TUNA FISHERY NEEDS

As of Oct. 20, 1971, saury landings were estimated at 130,000 metric tons. Close to 25,000 tons were frozen as baitfish for the tuna fishery. This is below minimum of 35,000 tons needed to supply Japanese, South Korean, and Taiwanese tuna vessels.

The outlook for further increase in frozen production this year is not very promising, so the price of bait saury is rising slowly. Recent market price for fish size of 150 count per 10-kilogram (22-lb.) box is 2,000 yen (US\$5.55), compared with 1,800 yen (\$5.00) in late September 1971.

Substitutes for Saury

Years ago, at least 60,000 tons of bait saury were needed for domestic tuna fishermen and for export to South Korea and Taiwan. More recently, the increasing substitution of squid and mackerel has reduced substantially the annual domestic bait saury requirements. ('Suisan Tsushin', Oct. 25, 1971.)

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SOVIET MACKEREL FLEET INCREASES
OFF NORTHEASTERN JAPAN

The Soviet Union is intensifying its mackerel fishing off Japan's northeastern coast. On Nov. 1, 1971, a Soviet fleet of 7,000-8,000-gross-ton motherships and about fifty 500-1,000-ton mackerel vessels was fishing 60 kilometers (37 miles) southeast of Hokkaido. Another mackerel fleet of eight 6,000-12,000-ton factory motherships accompanied by thirteen 300-ton purse seiners was sighted for first time fishing as close as 7 kilometers (4.3 miles) off Hachinohe, Aomori Prefecture. Reportedly, the fleet cut into area being worked by Japanese mackerel vessels and damaged fishing gear.

Soviet Rejects Request

On November 4, the Foreign Ministry asked the Soviet Embassy to put an end to the fishing so close to the coast of Hachinohe. It is here that local Japanese boats are observing voluntary regulations of the mackerel and squid fisheries. The Soviets replied

that the area was "high seas". They said their vessels are under no legal restrictions beyond the 3-mile limit. ('Suisan Keizai Shimbun', Nov. 8, 1971.)

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SURVEY WEST GERMAN
CANNED-TUNA MARKET

The Japanese have been studying the canned-tuna market in West Germany, second largest market after the U.S. In 1970, W. Germany purchased 1.26 million cases from Japan, according to the Japan External Trade Organization (JETRO). This was 83% of West Germany's canned-tuna imports. (In 1968, Japan's share was 94%; in 1966, 83%.)

Imports from Japan in 1971 were likely to fall below 1970 level because of mercury-in-tuna problem, although there have been practically no rejections in W. Germany.

Canned-fish consumption in West Germany is trending upward. There are heavy demands for canned herring fillets, sardine in oil, and tuna in oil, according to JETRO.

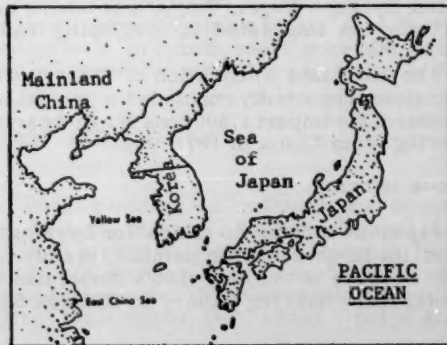
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IMPORTS \$9 MILLION WORTH OF
'YELLOW SEA PRAWNS'

Japan agreed to import from China this fall 2,400 tons of Yellow Sea prawns (*Penaeus orientalis* or 'giant prawn') worth \$8,971,800 (\$3,712 per metric ton or \$1.68 per lb.). ('Suisan Tsushin', Oct. 1, 1971.)

NMFS Comment: Yellow Sea prawns are fished by the Japanese, South Koreans, and Mainland Chinese.

In 1970, Japan imported \$19,282,000 worth of shrimp from China--about 40% of the \$49 million in fishery products from that country.



JAPAN (Contd.):

SEEK 3,000 MINKE WHALES
IN 1971-72 ANTARCTIC SEASON

On Oct. 12, 1971, Japan Fisheries Agency approved an exploratory whaling license for Taiyo Fisheries to hunt minke whales exclusively during the 1971-72 Antarctic Whaling Season. It is the first time any country's fleet will catch minke whales exclusively. During 1969/70 season, Taiyo's baleen-whale fleet harvested 500 minke whales. The 1971-72 season target is 3,000.

Taiyo's Fleet

The Taiyo fleet includes 1 mothership and 4 whaling boats.

NMFS Comment: The switch to minke whales is due to decrease in Antarctic whaling quota. Minke whales, not considered endangered, are not covered under International Whaling Commission's catch quota.

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1971 FISHERY IMPORTS
FROM CHINA NEAR RECORD

The value of marine products imported into Japan from China in 1971 is expected to set a record, reports the Japanese press. In 1970, Japan imported marine products worth US\$23.2 million: Shrimp, \$19.2 million; 'other', \$4 million. These were 9.1% of all Chinese exports to Japan (\$254 million).

At Canton Fair

A record 1,450 Japanese firms participated in 1971 Autumn Canton Fair. Nippon Reizo, Kyokuyo Hoge, Taiyo, and others reportedly are interested in developing trade.

The Hokkaido Federation of Fishery Cooperatives reportedly concluded a provisional contract to import 1,500 tons of egg-bearing herring from China in 1971-72.

Needs Herring

Japan is turning to China for herring to meet its large domestic demand, mainly for roe, because of the near-100% Soviet ban on the Japanese herring fishery in Okhotsk Sea;

also, because of poor herring fishing in North Pacific. Japan also imports herring-roer products from Canada and the U.S. ('Japan Economic Journal', Oct. 19, 1971; 'Suisan Keizai', Oct. 15, 1971.)

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FROZEN-FOOD MARKET EXPANDS

Fish and shellfish products now account for 30% of Japan's frozen-food market. Frozen foods were introduced in 1965; by 1970, these were worth US\$138 million.

Nearly 500 firms produce frozen foods--but 80% of total output is produced by the 5 largest fishery firms: Nippon Reizo, Nippon Suisan, Nichiro, Taiyo, and Kyokuyo Hoge. These firms also pack nonmarine products.

70% To Restaurants

Currently, 70% of Japan's total supply of frozen foods goes to restaurants, but private demand is rapidly increasing as the use of cooking ranges and freezers grows. Despite this rise, per-capita consumption of frozen foods is still only 1 kilogram (2.2 pounds) per year; this compares with over 30.7 kgs (67.5 lbs) of fish products (fresh, frozen, chilled, and canned) a year. ('Manichi', Nov. 10, 1971.)

* * *

SKIPJACK POLE-AND-LINE
VESSEL CONSTRUCTION RISES

Construction of skipjack pole-and-line vessels in 1971 rose sharply over 1970. As of mid-September 1971, 54 vessels were built, compared with 60 during the 12 months in 1970. At present rate, 1971 construction is likely to reach 100 vessels.

There is a noteworthy increase in large-size vessels--13 in 299-gross-ton class. The largest size built in 1971 is 404 tons, compared with 299 tons in 1970.

The skipjack vessel construction boom is attributed primarily to the skipjack fishing-ground development surveys in the equatorial western Pacific, stable market price, and the possibility of year-round operations in the skipjack pole-and-line fishery. ('Suisancho Nippo', Nov. 18, 1971.)



GREAT LAKES RESOURCE MANAGEMENT

"Resource Management in the Great Lakes Basin," edited by F. A. Butrico, C. J. Touhill, and I. L. Whitman, Battelle Memorial Institute, published by Heath Lexington Books, D.C. Heath and Company, Lexington, Mass. 186 pp., charts, and tables.

The editors believe that the many studies made on the Great Lakes Basin have failed to consider the "total system"--and that "the concepts developed in this book represent a new approach to traditional resource management in the Great Lakes Basin." They emphasize the book's timeliness: the people of several states now are being asked to decide the Great Lakes' future by their votes on bond issues.

Six problem areas are outlined: water quality; water levels and interbasin transfer; ecological imbalances; institutional arrangements; economic; and social. One estimate of the cost of depolluting the Great Lakes is more than \$8 billion.

Water Quality: The 5 Great Lakes reflect "misuse and abuse of environment by man." Lake Erie has suffered most--followed by Lakes Ontario, Michigan, Huron, and Superior. There is close correlation between population growth rates in the drainage basins around each lake and the rate of deterioration in water quality. "The conclusion is inescapable--man is directly responsible for the accelerated deterioration of water quality. If corrective action is not taken, further deterioration will accompany future population growth."

Water Levels and Interbasin Transfer: The problem of water quantity will become significant. More attention should be given to "reductions in inflows, potential reduction in outflow, and consequent variation in Lake levels." Some planners are thinking of continental water plans--from Alaska to Mex-

ico--and the Great Lakes would play a "presently unpredictable" part in these.

Ecological Imbalances: The growth of aquatic organisms is seriously impairing the beneficial uses of Great Lakes water. The biological system is changing constantly. It contains many life forms that depend on the "total ecological balance of the environment for their existence." The balance is influenced by such factors as: "the concentrations of suspended and dissolved organic and inorganic compounds; the availability of these compounds as nutrient materials; the concentrations of dissolved gases including oxygen; and the availability of sunlight."

Institutional Problems: "... analyses of water resources policy and polity is needed to ensure that progress in these aspects of water management is commensurate with technological progress."

Economic and Social Problems: Although the water resources of the Great Lakes Basin are not fully developed, resource planners are concerned most about satisfying the demands of all water users.

Financing: "The costs of water management are high." Today, the most important problem is to finance treatment facilities to control water quality.

Public Involvement: In the end, the voting public will have a decisive voice. An effective management program must generate information for public and government.

SPORT FISHING USA

"Sport Fishing USA"--Dan Saults, Managing Editor; Michael Walker, Editor; Bob Hines, Illustrator; Rex Gary Schmidt, Photo Editor, 464 pp. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 - price \$10.

The U.S. Bureau of Sport Fisheries and Wildlife has cast an authoritative net over salt and freshwater sport fishing. Rich in information and color, this book will lure amateurs and experts.

Forty-three leading writers and scientists contributed to it. There are 21 color paintings by Bob Hines, whose work long has been a paean to nature and wildlife, and many sumptuous photos.

'Sport Fishing USA' includes the history of fishing and the fun and frustration of it; fish feeding and breeding; equipment and techniques; fish migration; how pollution is altering the underwater environment; exotic fishes; the pressure of fishermen on fish; and many other interesting subjects.

TROPICAL AMERICAN MOLLUSKS

"Studies in Tropical American Mollusks, edited by Frederick M. Bayer and Gilbert L. Voss, 236 pp., illus., \$12.50s, 1971. University of Miami Press, Coral Gables, Florida 33124.

The book contains 4 papers on molluscan fauna on either side of the Isthmus of Panama. These discuss a part of the preliminary findings of research on the "feasibility and impact of a proposed interoceanic sea-level canal to connect the waters of the Gulf of Panama and the Caribbean Sea."

The editors state: "The Caribbean and Pacific coasts of Middle America of the present day are descended from what was once a broad tropical American faunal province, and the thorough knowledge of forms as they exist will provide a deeper insight into their development through geologic ages. Thus, if man can alter the marine environment on such a scale as by the artificial reuniting of the Atlantic and Pacific faunas, he inevitably will continue to do so in countless lesser ways, and studies such as these are needed to enhance our knowledge of the marine biota before the environment changes proceed farther."

The 4 papers are: "Cephalopods Collected in the Gulf of Panama," by Gilbert L. Voss; "Mollusks from the Gulf of Panama," by Axel A. Olsson; "The Conidae of the 'Pillsbury' Expedition," by James Nybakken; and "New and Unusual Mollusks Collected," by Frederick M. Bayer.

ESTIMATING AQUATIC-ANIMAL PRODUCTION

"Methods for the Estimation of Production of Aquatic Animals," Edited by G. G. Winberg, Zoological Institute Academy of Sciences of the USSR; translated by Annie Duncan, Royal Holloway College, University of London, 175 pp., \$9.00, 1971. Academic Press, London and New York.

While there were handbooks on the methods of estimating the production of fish, there was none on the production of other aquatic species until this Soviet publication. It resulted from a project begun by the Soviet National Committee of the International Biological Program. It compiles the research and theoretical work of many distinguished Soviet biologists. The book summarizes "the important work on biological production carried out in the USSR over the past 30 years."

It explains methods of measuring wet and dry weight, colorific values, fat protein and carbohydrate content. It discusses theories of animal growth and the effects of temperature on development duration and growth rate. These factors are used as a basis for several methods of computing production.

The book also describes an alternate approach to estimate invertebrate production from the quantities seen eaten by fish from seas, lakes, and fish ponds.

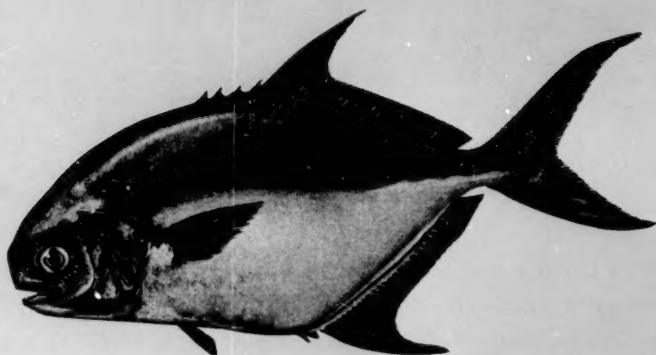
There is a reference list to Soviet literature--and translated titles and guide to available English translations.

COMMERCIAL OIL-FIELD DIVING

"Commercial Oil-Field Diving," by Nicholas B. Zinkowski, 372 pp., illus., \$12.50, 1971. Cornell Maritime Press, Inc., Box 109, Cambridge, Maryland 21613.

This is a manual for working divers and trainees, a practical book on all phases of oil-field diving. It includes such subjects as: "Diving as a career, physics and physiology, tending and breaking out, diving equipment, decompression and treatment tables for compressed-air diving, rigging, burning and welding under water, use of explosives, diving from a pipe-lay barge."

FOOD FISH FACTS



Pompano
(*Trachinotus carolinus*)

Florida pompano, also known as cobblerfish, butterfish, and palmenta, are generally considered one of the most delicious of marine fishes. Most pompano are caught in the waters of the South Atlantic and Gulf coasts of the United States where local demand usually exceeds supply. Some fish are shipped north to gourmet restaurants.

Description

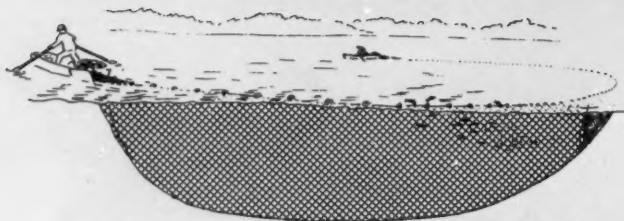
The Florida pompano, one of three species of the *Trachinotus* family, is the only commercially important species. It is a thin, deep-bodied fish with deeply forked caudal and dorsal fins having a silvery body shading to metallic blue above and to a golden yellow ventrally. A blue line appears above and in front of the eyes. The upper fins are dark while the lower fins are yellow, shaded with blue. Pompano have the ability to change color in different surroundings from silvery to very dusky with an intermediate "peppery" stage. Spines and soft rays are found in the dorsal and anal fins. Florida pompano are

not to be confused with the Pacific or California pompano. The latter fish is a member of the butterfish family rather than the pompano family. The true pompano, a relatively small fish, range in weight from $1\frac{1}{2}$ to 3 pounds commercially, although some fish exceed 6 pounds in weight.

Habitat

The complete life history of this fish is still relatively unknown. Males generally reach maturity in their first year and females in their second year. Spawning is thought to occur offshore in areas where the current will carry the young back to shore. Peak spawning is in the spring although some fish spawn throughout the year. Young pompano, about a month old and less than an inch long, first appear on the Florida beaches in April or May. After a six-week growing period, they migrate northward to New England where they appear in July and remain till October or until cold weather starts them on their journey south to warmer temperatures and

(Continued following page)



Runaround gill net

waters. Life span is estimated to be 3 to 4 years under normal conditions. Pompano feed mainly on bottom organisms such as crabs, shrimp, and mussels.

Fishing

Commercial landing of Pompano are made from Virginia to Texas but most of the catch in the United States is from Florida waters. To increase the "never sufficient" supply, airplane spotters have been employed in the Florida Keys to assist fishermen in locating schools of fish. Pompano are caught all year but the major fishery occurs in March, April, and May. Adult pompano are generally netted with commercial trammel or gill nets but haul seines, runarounds, hand lines, and otter trawls are also used.

Farming

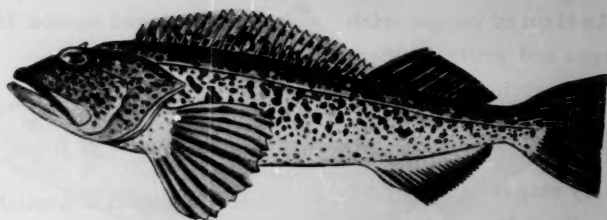
Florida pompano have great potential for fish farming because of their high market value, consumer demand, and research progress. Since knowledge of induced spawning and hatching of captive pompano is still

limited to experimental studies, fish farmers have to depend upon wild stock taken from the ocean's surf. It is estimated that some fish have between 400,000 to 600,000 eggs, and once a technique for controlled spawning is perfected, a few fish maintained as brood stock could supply a large number of young for hatchery operations. Farm-raised pompano grow about one inch a month and can reach commercial size of 10 inches in less than a year.

Uses

Florida pompano are excellent for broiling, baking, and planking, and are recommended for pan and deep-fat frying. One of the more exotic, epicurean preparation methods for this delicacy is Pompano en papilote--seasoned fish baked in oiled paper "envelopes." Pompano are sold "in-the-round" or gutted. Preferred market size is usually 1 to 1½ pounds. (Source: National Marketing Services Office, NMFS, U.S. Department of Commerce, 100 E. Ohio Street, Room 526, Chicago, Illinois 60611).

FOOD FISH FACTS



Lingcod
(*Ophiodon elongatus*)

The lingcod, a fish native to the Pacific coast, is considered by many to be one of the finest eating fishes of the West. Although the name denotes "belonging to the cod family," it is misleading. Lingcod, first recorded in 1881 as coming from the waters of British Columbia, is a member of the Hexagrammidae family, one of a number of species commonly called greenlings. Local, more colorful names for the lingcod are blue cod, buffalo cod, and cultus cod. The latter name comes from the Indian term cultus, meaning false. Lingcod is not a true cod.

Description

For such a highly prized fish, appearances are both deceiving and detracting. Coloration, highly variable, is closely associated with habitat. Basically, lingcod has subdued coloration ranging from a mottled brown to bluish-green with cream colored undersides. The spots or blotches are brown, green, or tan, outlined in orange or light blue. Female markings, usually lighter in color, have orange tracings rather than blue. The lingcod has a large protruding mouth armed with good-sized canine-like teeth, two large,

fleshy flaps (cirri) above the eyes, double nostrils, and a long, deeply notched, dark dorsal fin. The body and head are covered with smooth, small scales. Males, which are usually smaller than females, range up to 3 feet, while females may attain a length of 5 feet. Lingcod range from 5 to 20 pounds average weight, although fish up to 40 pounds are not uncommon. A few have been recorded that weight up to 100 pounds.

Habitat

The bottom-dwelling, extremely voracious and prolific lingcod favor intertidal zone reefs and kelp beds that have strong tidal currents. As adults, lingcod are found at depths from 60 to 100 fathoms along the entire Pacific coast. They range from the Baja Peninsula of California to Northwest Alaska but are most abundant in the colder waters of the north.

Life History

In a single spawning, the female deposits her eggs, upwards to half-a-million, in large adhesive, pinkish-white masses in sheltered, rocky locations or on kelp beds below the lowest tidal levels. In minus tides, they can be seen clinging to kelp or rocks. After fer-

tilization, the male guards them until hatched. He fans the eggs with his fins to provide good circulation of oxygen-rich waters around the eggs and protects them from intruders with swift, vicious passes at any approaching danger. Principal spawning season is from December to March. Little is known about the early stages of lingcod development, but fingerlings from 3 to 5 inches long are taken occasionally by seining in the eelgrass during the summer. Tagging studies indicate lingcod do not travel widely from natural habitat. The young feed on small crustaceans while adults graduate to herring, flounders, cod, hake, squid, crustaceans, and little lingcod that are unfortunate enough to be in the area at dinnertime.

Fishing

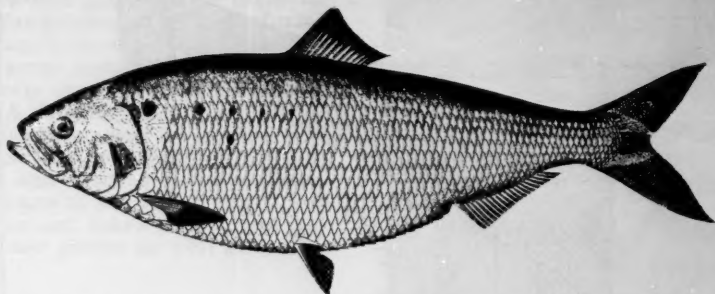
Commercial fishermen obtain most of the lingcod catch with otter trawls. However, some fish are taken with set lines, handlines, and troll lines. The vast majority of the catch is taken from Washington State waters followed by catches from Oregon, Alaska, and California. Fishing for lingcod is year-round along the entire Pacific coast but is best in California from April to October. Further north the fishing is best from October to May. Lingcod is a highly prized fish which gives anglers an exciting battle on light tackle. When a lingcod is caught, however, the hook has to be removed with care because of the fish's dangerously sharp teeth. In recent years, spearfishing for lingcod by skindivers

has become popular in Puget Sound. The sport has become so popular that the state now has a closed season for spearfishing to prevent exploitation.

Use

Fresh lingcod is available along the Pacific coast, but the fish is sold frozen in other areas of the country. It is highly desirable as a fine eating fresh fish and is marketed as dressed, fillets, and steaks. Smoked lingcod is another delicacy found in the markets. A characteristic that keeps the uninitiated from trying lingcod is the unusual green or bluish-green color of the flesh. The greenish color flesh is most common in the smaller, immature fish. It is not harmful and disappears upon cooking to produce a delicate, white, tender flesh very low in fat. Some of the preferred methods of preparation for lingcod fillets and steaks are broiling, butter-sauteing, and poaching. Whole fish can be baked or poached. For broiling, natives often split small fish down the middle, remove the backbone and cook. An increasingly popular method for preparing lingcod is to pan or deep-fat fry for "fish and chips." Today, most of the lingcod produced goes into the rapidly expanding commercial "fish and chips" trade. (Source: National Marketing Services Office, NMFS, U.S. Dept. of Commerce, 100 East Ohio St., Rm. 526, Chicago, Illinois 60611.)

FOOD FISH FACTS



AMERICAN SHAD
(*Alosa sapidissima*)

Shad, a springtime favorite for hundreds of years, was known as elft, the eleven fish, to the early Dutch settlers. It was on the 11th day of March each year that the first shad were caught and cooked on a plank, a method the settlers learned from the Indians. Shad were so abundant in colonial days and the first days of the Republic, that it became unfashionable among some of the well-to-do. Many of them ate shad on the sly, fearing that others would think them unable to afford more expensive foods. Many prominent people, however, put aside their pride and enjoyed shad openly. George Washington was among the latter and history reveals that he was especially fond of baked shad. Shad became the excuse for parties in Washington, and senators and representatives often sailed down the Potomac on Saturday mornings for the sole purpose of eating shad and enjoying a few drinks.

Description

Shad are members of a large family of fish which includes the herring. Shad is the largest member of this family, reaching up to 14 pounds in weight, and up to 30 inches in length. Shad caught today, however, rarely reach over 9 pounds in weight. Silvery colored with a bluish-green metallic luster on the back, shad have a deep body and a serrated midline on the belly side. Their scales are large and easily loosened. Unlike the sea herring, shad do not have teeth on the roof of the mouth; however, young shad do have small teeth in the jaws which may last until they are a foot or more in length. Shad are distinguished from other

members of the herring family by having a prominent dark spot behind the gills, followed by a row of lighter spots, a deeply forked tail, and the adults are toothless.

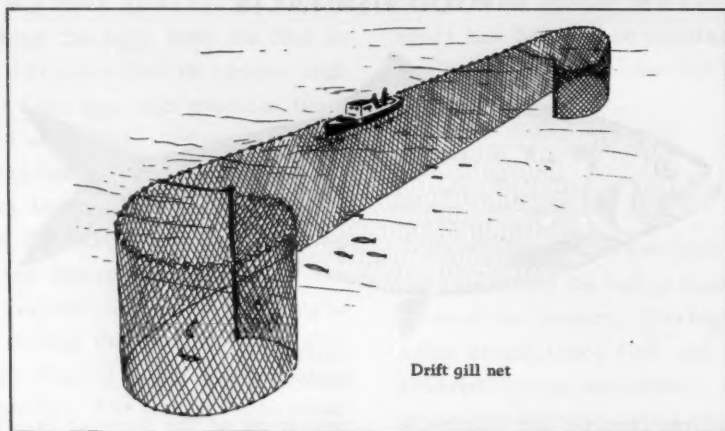
Habitat

Shad are native to the Atlantic and can be found from the Gulf of St. Lawrence down the coast to Florida along the Gulf of Mexico. They are most abundant, however, from North Carolina to Connecticut. In 1871, shad were successfully planted in the Sacramento River in California, and shortly afterwards, in the Columbia River. Now they occur along the Pacific coast from the Mexican border to Alaska. Plantings in inland lakes and streams were unsuccessful.

Shad are anadromous, like salmon, spending most of their lives in the ocean but returning to their natal streams to spawn. Young shad spend their first summer in the stream where they were hatched. When they are 3 to 6 inches long, they migrate to the ocean, remaining there until they mature. At approximately 3 to 4 years of age, shad return to their natal stream to spawn. Spawning occurs in January in warmer waters and up until June in colder waters. For reasons still unknown, shad that spawn in coastal streams of the South Atlantic States die after spawning, while those that spawn further north survive and return again the next year.

Shad Fishing

Shad was an important food for the Indians long before the first settlers arrived. The Indians used many methods to catch the shad,



Drift gill net

including bush nets or seines, weirs, spears, and bows and arrows. Early settlers used weirs, drift gill nets, dip nets, and haul seines. The haul seines were the most efficient and most often used. Gear today remains essentially the same but the techniques and net materials have changed. Shad has become very popular as a prized game fish in recent years, jumping out of the water frequently, striking hard, and giving the fishermen a game fight. Although shad have decreased in quantity, they are still available in sufficient numbers to support fisheries of great commercial and recreational values.

Management and Conservation

Several states along the Atlantic coast have worked independently and jointly with the NMFS in investigating shad resources. The studies made were primarily to acquire basic knowledge of the species and, through scientific management, to increase the size of the shad run and the annual yield. Shad populations in several rivers are being effectively

managed as a result of these studies. Primary problems facing the Service and the fishing industry are pollution, overfishing, and dams on rivers which prevent shad from making their spawning runs. All fishery research, whether state or federal, has a basic goal to ensure the wise use of a renewable resource.

Uses of Shad

Fresh shad are available from January into June and can be bought either whole, drawn, or filleted. Shad have a large, complicated bone structure and, for ease of eating, may be boned at the seafood market. The texture of the flesh is delicate and it is best to leave the skin on while cooking. This tasty fish can be broiled, baked, planked, stuffed, or sautéed. Shad roe is considered a great delicacy by gourmets, and can be bought either fresh or canned. (National Marketing Services Office, National Marine Fisheries Service, U.S. Department of Commerce, 100 East Ohio St., Rm. 526, Chicago, Ill. 60611.)

CRANBERRIES FIND HAPPINESS WITH FISH

The fall and winter months offer many opportunities for fun get-togethers and informal hospitality. Many homemakers entertain often but in a casual manner, and the invited guests are family members, neighbors, or close friends. A thoughtful hostess has rapport with her guests in many ways. She helps them feel at ease, invites people who are congenial together, and chooses her menu carefully. She is aware of the importance of dietary problems and takes these into consideration for her guests as well as for her family.

Today's homemakers know that good health and good nutrition are a twosome--you really can't have one without the other. She chooses fishery products often because of their high nutritive value and the fact that the fat content is polyunsaturated. Knowing that fish are as good to eat as they are good for the eaters, she prepares them with imagination and serves them with a flair to her guests and family. Fish fillets are often her choice because of their versatility and the wide selection available at a moderate price.

Fish Fillets With Cranberry-Orange Sauce, a tasty new, recipe from the National Marine Fisheries Service, was created especially for the homemaker who likes an entrée that is gourmet without spending gourmet \$\$\$\$ for it or devoting endless hours in preparation. This hearty but elegant entrée has tender fish fillets served over a dressing made interesting with orange juice and rind, textured with celery and onions, and crisped with pecans. Cranberries are usually thought of as an accompaniment of the big bird at Thanksgiving time, but until you've tried a Cranberry-Orange Sauce over succulent fish, you really can't appreciate these tart little berries. Fish and cranberries are a natural--they were meant for each other.

This easy but elegant entrée is just right for family eating or casual entertaining. Serve with a salad or your choice of vegetables and a selection of fresh fall fruits for dessert. Who could ask for anything more?

CRANBERRY-ORANGE SAUCE

$\frac{1}{3}$ cup sugar	$\frac{1}{2}$ cup water
2 teaspoons cornstarch	1 cup raw cranberries
$\frac{1}{2}$ cup orange juice	2 teaspoons grated orange rind



FISH FILLETS WITH CRANBERRY-ORANGE SAUCE

- 2 pounds thick fish fillets, fresh or frozen
- 1 cup sliced celery
- $\frac{1}{3}$ cup chopped onions
- 6 tablespoons margarine or cooking oil
- 4 cups soft bread cubes ($\frac{1}{2}$ -inch)
- $\frac{1}{2}$ cup chopped pecans
- 1- $\frac{1}{4}$ teaspoons salt
- 1 teaspoon grated orange rind
- $\frac{1}{4}$ cup orange juice
- Cranberry-Orange Sauce

Thaw frozen fish. Cut fillets into 6 portions. Cook celery and onions in a 10-inch fry pan in 4 tablespoons margarine or cooking oil until tender but not brown. Stir in bread cubes, pecans, 1/4 teaspoons salt, orange rind, and orange juice. Turn stuffing into well-greased baking dish, 12 by 8 by 2 inches. Arrange fish in a single layer on stuffing. Drizzle remaining two tablespoons melted margarine or cooking oil over fish. Sprinkle with 1 teaspoon salt. Bake in a moderate oven, 350° F., 25 to 30 minutes or until fish flakes easily when tested with a fork. Serve with Cranberry-Orange Sauce. Makes 6 servings.

Combine sugar and cornstarch in a 2-quart saucepan and mix. Add orange juice and water; cook, stirring constantly, until mixture comes to a boil. Add cranberries and cook 5 minutes or until skins on cranberries pop, stirring occasionally. Fold in orange rind. Serve with fish. Makes 1-1/4 cups sauce.

(Source: NMFS, NOAA, 100 East Ohio Street, Room 526, Chicago, Illinois 60611.)

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BACK COVER: The 'Murre II' approaches
NMFS Auke Bay (Alaska) Laboratory Dock.
(J. M. Olson)

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